"Rack & Stack" on Prem S3 with MinIO and the Seagate EXOS 4u100 AP

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Introduction

MinIO is a High Performance Object Storage released under Apache License v2.0. It is API compatible with Amazon S3 cloud storage service. MinIO is an exceptionally easy to deploy and manage, and performant Amazon S3 API compatible software defined storage software stack.

The Seagate® Exos® AP 4U100 is the datasphere's highest density combination of compute and storage in a single system. While delivering state of the art density, capacity, and cost effective HDD performance - it also simplifies data center deployment by reducing compute plus storage to a single, widely available commodity component. Solution architects no longer need to mix & match and qualify individual components from multiple vendors, Seagate's fully qualified Exos 4u100 AP provides a one stop, proven and demonstrable solution.
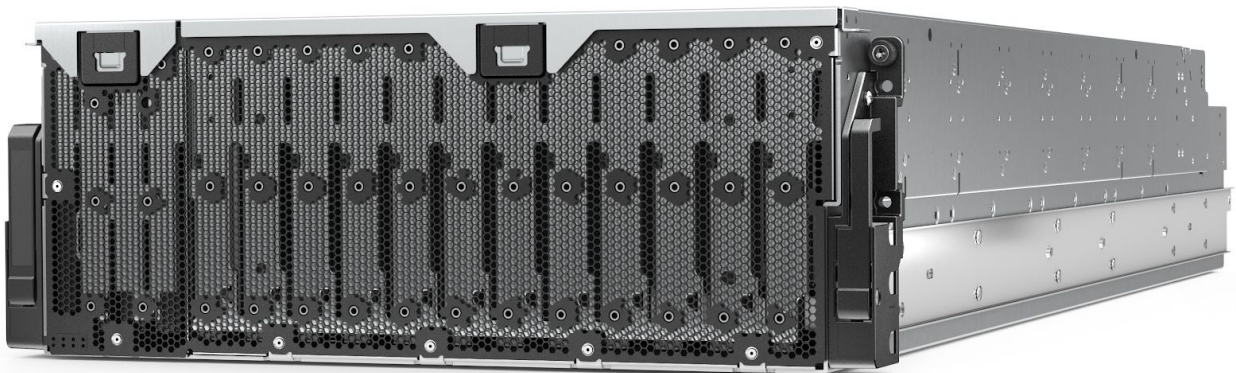
The hardware test environment

Material List:

Storage Compute Nodes	Three Exos 4u100 AP each with 2 Rockingham Controllers
	Dual socket Xeon 4110 @ 2.1 GHz 16 cores per socket
	RAM: 256GB
Test Compute Nodes	Server: Intel 1U R1208WFTYS
	CPU: Xeon(R) CPU E5-2640
	RAM: 128GB DDR3 D3-68SA104SV-13
SAS HDD Drives	Exos X16 16TB ST16000NM002G
Network	Mellanox CX516-A ConnectX-5 Dual 100 GbE
	Mellanox SN2100 16 Port 100GbE Switch

The software test environment

Host OS	SuSE SLES 15 SP2
MinIO Server	RELEASE.2021-01-08T21-18-21Z
MinIO Warp (test driver)	v0.3.29
Test scripts:	https://github.com/suykerbuyk/minio.s3.on.st.4u100

Test permutations exercised

For each configuration of of GET, PUT, an DEL:

- Concurrency (threads) on each of 4 test clients from:
  - Each Client: 8, 16, 24, 48, 96, 128 threads
  - Total Threads: 32, 64, 96, 192, 256, 512
- Object Sizes:
  - .125 MB, .5MB, 1MB, 4MB, 16MB, and 64 MB
- Disk schedulers:
  - "none/noop", deadline, kyber, BFQ
  - "None/noop" was best for small objects, deadline best overall.
- With and without MinIO S3 Caching on Nytro SSDs
  - Almost no discernible effect
- With and without XFS metadata caching on Nytro SSDs
  - 12 256MB partitions on each of four 3.84TB Nytro SSDs such that each of 32 XFS formatted spinning disks were assigned an SSD partition for metadata caching.
  - Approximately 5% performance boost for small objects.
  - No measurable effect on 64MB objects.
- MinIO cluster sizes
  - 8, 16, and 32 disk per Rockingham.
  - Fairly linear scaling with disk count.
- Network Configuration
  - Single port 100GbE for both client and server private.
  - Dual port 100GbE
    - One port for client communication
    - One port for server internal communication.
  - No substantial difference.
- In total:
  - 108 permutations of thread and concurrency per test for each of PUT, GET, DEL.
  - 15 variations of platform and performance tuning for each of the 108 permutations above and for each of the three primary operators.
  - All data, scripts, and reports are hosted here (41GB of data!): https://drive.google.com/drive/folders/1fler23_aUQMrQlBvd29LE6_GC2CJP73Z?usp=sharing
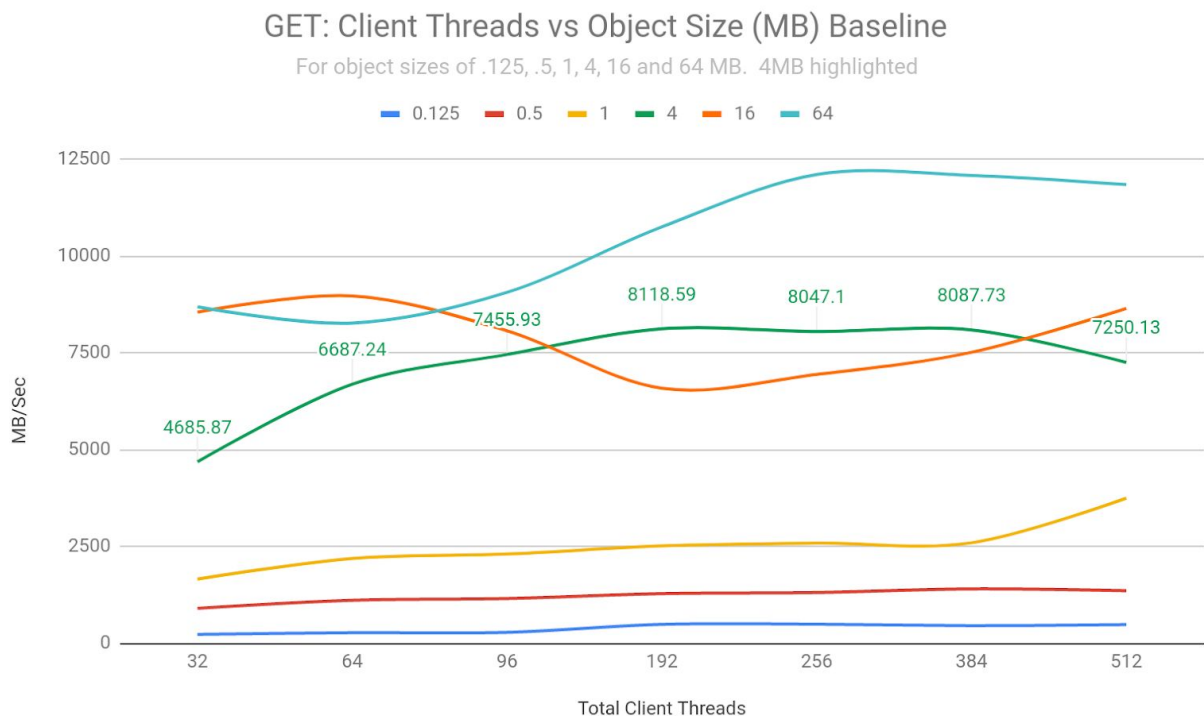
Test Results, best case scenarios.

MinIOs read performance is simply outstanding. Measured throughput on our 100GbE links hovers at around a peak of 22.5 GB/Second. MinIO was able to achieve 12GB/S, which given the way MinIO ingest on one server node and fans out the request to it's peers, represents an ability to saturate our links. What was surprising is when we gave MinIO it's own private network connections for intra-server communication, we did not see an increase of overall client throughput.

Read (GET) MinIO Performance, default configuration

Below we see the "default" out of the box performance with 32 16TB Evans drives, with the default EC:8 erasure coding, default single (100GbE) network routing, default "deadline" disk scheduler, and no added SSD caching to speed up operations.

The data point that most aligns with the SmartShelf opportunity is the 4MB, 192 thread data point at 8GB/Sec, far and away exceeding requirements and even the best "read" performance the RA Lab has ever gotten from CEPH.

GET: Client Threads vs Object Size (MB) Baseline
For object sizes of .125, .5, 1, 4, 16 and 64 MB. 4MB highlighted

Read (GET) Minio performance, tuned configuration

Below we see MinIO being run with XFS metadata caching on Nytro SSDs, dual network paths, and the "deadline" disk scheduler.

Compared to the default performance we were able to get the critical 4MB object read/GET performance up from 8GB/Sec to over 9GB/Sec, a delta of about 12% in total.

GET: Baseline Config with EC:4 and XFS cache
For object sizes of .125, .5, 1, 4, 16 and 64 MB. 4MB highlighted

Read (GET) performance comparison with SuSE CEPH

The plot below is a vertical axis normalized plot of the best numbers we were able to achieve with SuSE CEPH (fully containerized on 4u100s, no external servers). While significantly slower, the results were far more consistent irrespective of client thread count.

For comparison:

Default MinIO 4MB/Obj 192 threads	8.1 GB/Sec
Optimized MinIO 4MB/Obj 192 threads	9.1 GB/Sec
SuSE CEPH 6 1MB/Obj 192 threads	2.7 GB/Sec
SuSE CEPH 6 100MB/Obj 192 threads	3.3 GB/Sec

GET: SuSE CEPH 6 on 4u100 Rockingham

For object sizes of .01, 1, 100, and 500 MB. 1MB highlighted

■ 0.01 ■ 1 ■ 100 ■ 500

Write (PUT) MinIO Performance, default configuration

Below we see the "default" out of the box performance with 32 16TB Evans drives, with the default EC:8 erasure coding, default single (100GbE) network routing, default "deadline" disk scheduler, and no added SSD caching to speed up operations.
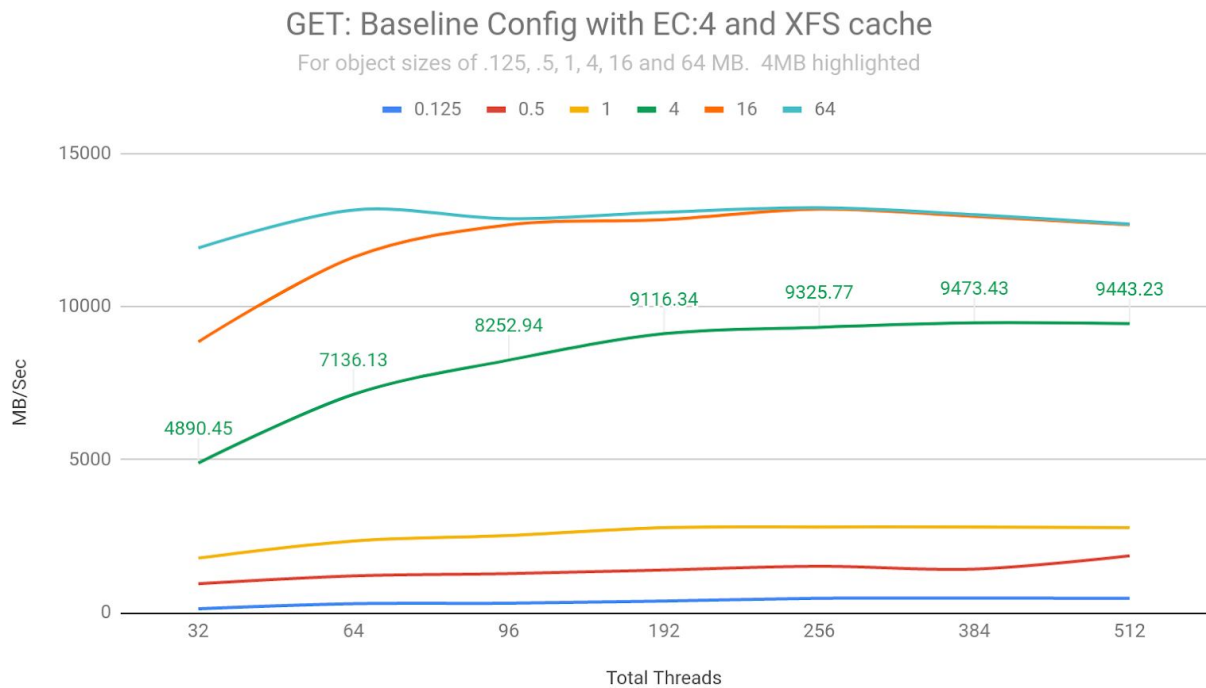
The data point that most aligns with the SmartShelf opportunity is the 4MB, 192 thread data point at 811 MB/Sec.

PUT: Client Threads vs Object Size (MB) Baseline
For object sizes of .125, .5, 1, 4, 16 and 64 MB. 4MB highlighted

Legend: ■ 0.125 ■ 0.5 ■ 1 ■ 4 ■ 16 ■ 64

Y-axis: MB/Sec (0, 2000, 4000, 6000)
X-axis: ObjSize MB (32, 64, 96, 192, 256, 384, 512)

Highlighted (green, 4MB) data labels: 381.06, 545.49, 548.35, 811.74, 876.35, 967.58, 1091.23

Write (PUT) Minio performance, tuned configuration

Below we see MinIO being run with XFS metadata caching on Nytro SSDs, dual network paths, and the "deadline" disk scheduler.

Compared to the default performance we were able to get the critical 4MB object read/GET performance up from 811MB/Sec to over 940MB/Sec, a delta of about 15% in total.
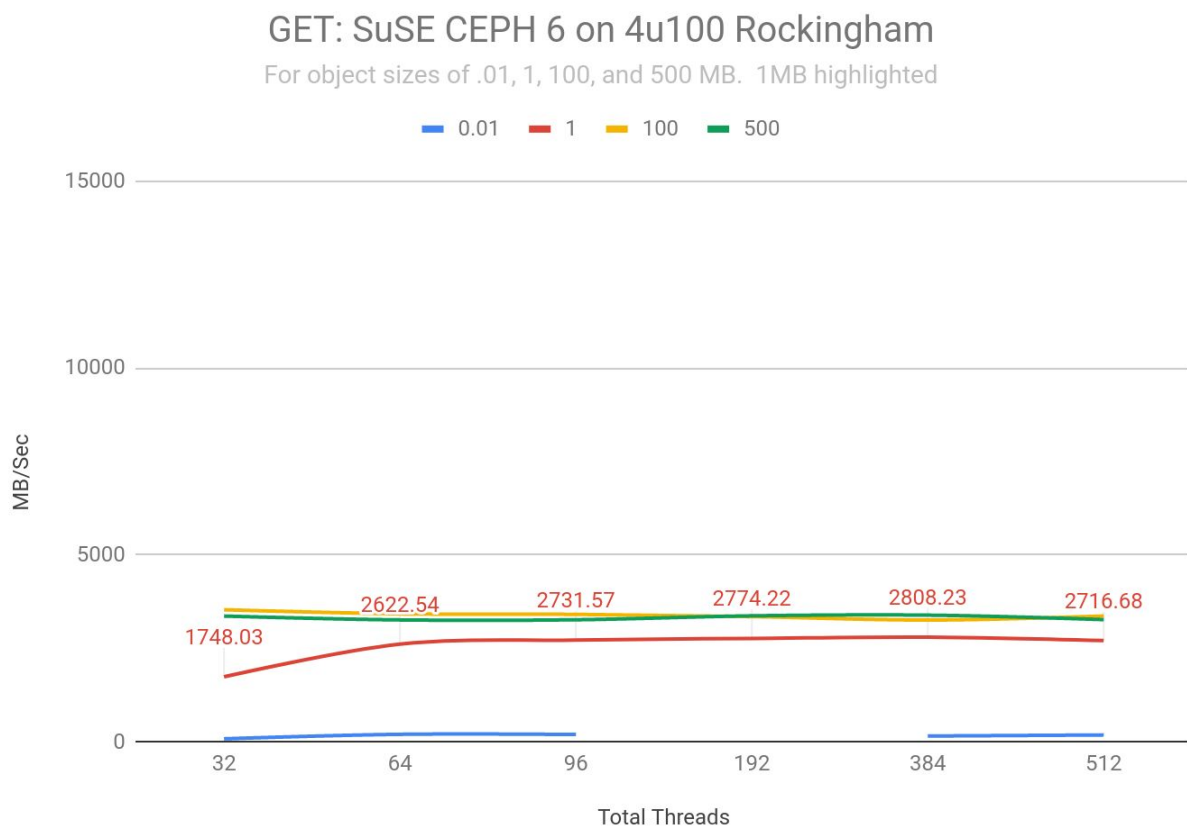
PUT: MinIO Baseline Config with EC:4 and XFS cache
For object sizes of .125, .5, 1, 4, 16 and 64 MB. 4MB highlighted

■ 0.125   ■ 0.5   ■ 1   ■ 4   ■ 16   ■ 64
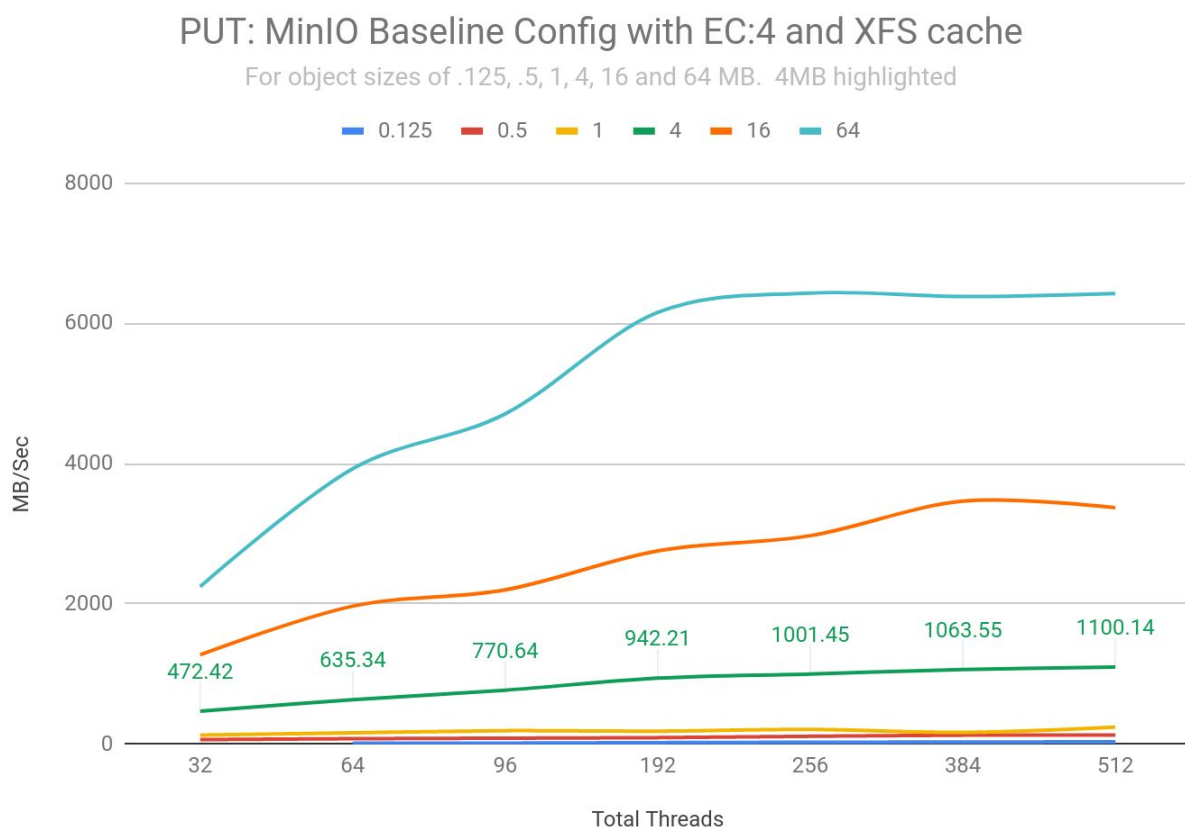
Write (PUT) performance comparison with SuSE CEPH

The plot below is a vertical axis normalized plot of the best numbers we were able to achieve with SuSE CEPH (fully containerized on 4u100s, no external servers). While significantly slower, the results were far more consistent irrespective of client thread count.
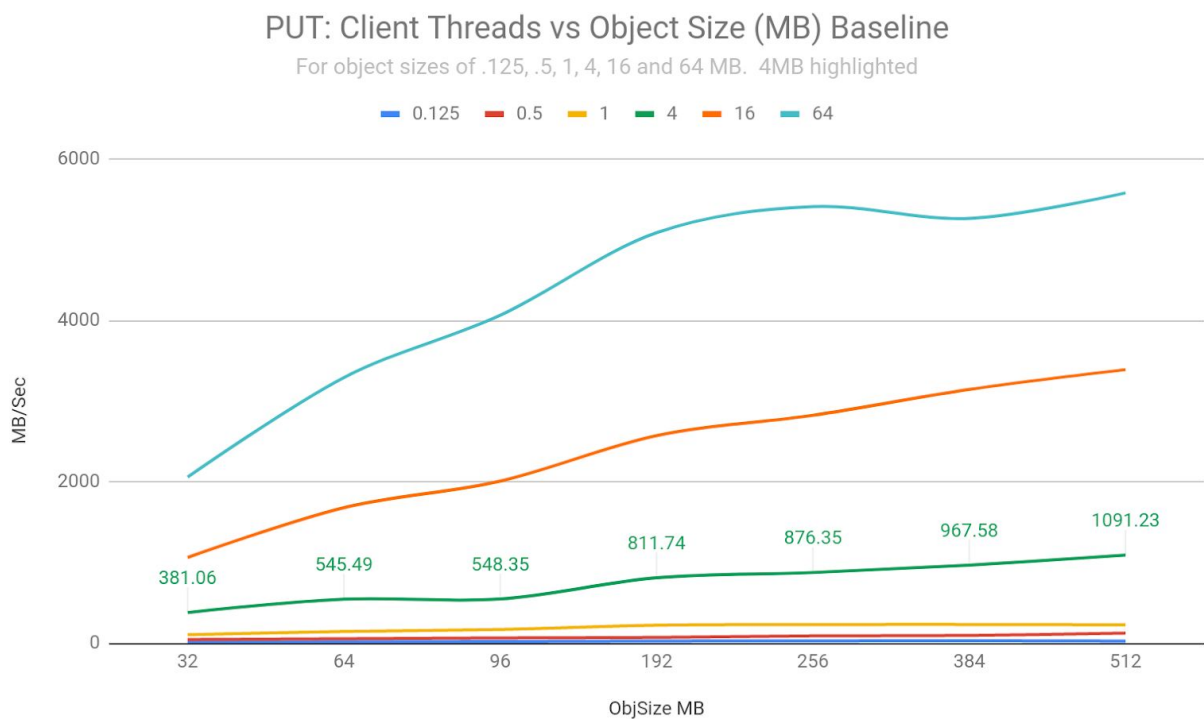
For comparison:

Default MinIO 4MB/Obj 192 threads	811 MB/Sec
Optimized MinIO 4MB/Obj 192 threads	942 MB/Sec
SuSE CEPH 6 1MB/Obj 192 threads	1,980 MB/Sec
SuSE CEPH 6 100MB/Obj 192 threads	2,825 MB/Sec

PUT: SuSE CEPH 6 on 4u100 Rockingham
For object sizes of .01, 1, 100, and 500 MB. 1MB highlighted

0.01　　1　　100　　500
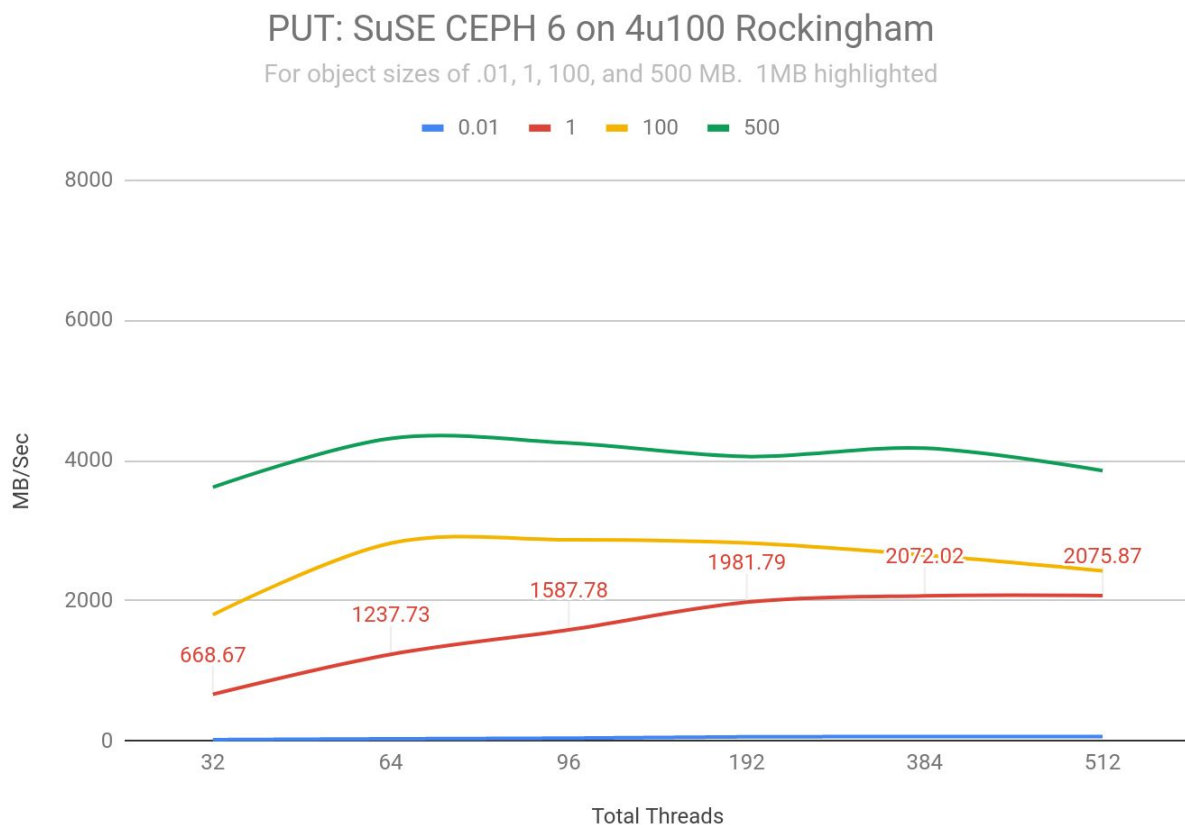
Test process details

Test configuration and topology

A simple VM was used as the test orchestration point as well as the control point for provisioning tasks. Leveraging a VM allows us to archive the entire runtime environment should we ever need to go back to it.

We chose SuSE SLES 15 SP2 as the common operating system as the RA Lab has been doing a lot of work on SLES and in terms of opportunities for comparison and contrasts of performance, it offered one less dependent variable to consider.

For a fully operational SuSE yast autoinstall script suitable for pxe based provisioning see SuSE autoyast network provisioning script.

For creating the instances of the MinIO server on each of the 4u100 Rockingham controllers, we used the script "MinioDiskPrep.sh". It provides functions to prepare the basic server configuration for Minio, partition and format all HDDs and SSDs involved in a given test scenario and it was designed to run all disk prep stages in parallel. It is able to completely reconfigure the and redeploy the MinIO backend in less than 25 seconds, for a 6 server nodes, in parallel. The disk scheduler for each test was set through an ssh call to "SetDiskScheduler.sh"

We leveraged 4 generic Intel 1U servers to serve as MinIO Warp test clients while running the MinIO Warp S3 benchmark tool. Each instance of the warp client was started remotely via a simple forked command:

```
warp client $(ip a | grep 172.20.2 | awk -F ' ' '{print $2}' | sed 's/\/.*//g'):8000
```

The MinIO Warp Server script (warp.test.sh) had the responsibility of stepping through the three way matrix of test data to be collected for each permutation of setup and disk configuration.

Specifically, it:
1. Copied over a copy of the testmon script.
2. Started testmon on each MinIO server.
3. For each object size of .125MB, .5MB, 1MB, 4MB, 16MB, and 64MB it:
   a. Tested with 8, 16, 24, 48, 64, 96 and 128 client threads per each of the four test nodes (32, 64, 96, 192, 384, 512 total threads per test).
   b. Tested each of four disk schedulers (none, deadline, kyber, bfq)
   c. For each of "PUT", "GET", and "DEL" S3 operations.
4. In total about 108 permutations for each of the three primary S3 operations across 15 platform configurations.

Conclusions

General observations

MinIO is by far the easiest to deploy, administer, and maintain S3 endpoint the RA Lab has ever tested. It is written in the Google invented programming language of "GO", and therefore has no external dependencies. The MinIO server is a completely self-contained 49MB binary that does not require anything other than copy/paste/run for installation and more importantly, has no external dependencies.

It incorporates built-in Prometheus/Grafana dashboard reporting and monitoring, again with nothing else having to be configured or installed. All operational parameters can be passed in at launch time with simple environmental variables or can be configured with the complimentary `mc` command.

MinIO is a truly exceptional software building block for building out on premise S3 services, or privately managed S3 endpoints in hybrid cloud configurations.

Read Performance

MinIO's S3 read (GET) performance has never been matched on this hardware. It is considerably faster than anything the RA Lab has tested. Most of our experience with other clustered file systems are limited to the latency of the slowest device participating in a "stripe" of data spread across several nodes and several disks. For example, in a CEPH 4+2 Erasure coding configuration, a chunk of data must be returned from each of 6 disks on six different enclosures in order to reconstruct the data stripe. With lots of concurrent operations from other clients, CEPH's ability to render the complete stripe will always be limited to the slowest disk to return it's contribution.

MinIO does not seem to suffer that impediment.

Write Performance

For large block IO (>64MB), MinIO's write (PUT) performance ranged from acceptable to excellent. But for small block IO we started encountering issues. As a sanity test, we built an all flash array for MinIO and found that for 4MB or smaller objects, the read performance was approximately 4x over write performance.

With higher latency HDD deployments, we found the read/write performance delta to be 8x or more. This relationship is exactly the opposite of what one would normally expect. When fanning data blocks out across a cluster, each data block bound for each server should be able to be dispatched asynchronously (as CEPH does via it's RadosGateways).

The crux of their problem is the way they leverage this module to effect O_DIRECT, synchronous writes:
https://github.com/minio/minio/tree/master/pkg/disk

They error on the side of pedantic write coherency with a level of paranoia that I think should be a "user option". It has the side effect of (almost) completely circumventing the Linux disk schedulers and the drive's ability to reorder its write cache to minimize latency.

For instance, under BlueStoreFS (CEPH), when I'm able to drive the HDDs to 90%+ busy levels, I still see AVIO latencies of under 4.2 ms (on average). With MinIO driving the "bus", their average IO latency with 60% busy disks is hovering north of 9ms.

I find this to be unacceptable, or at least an HDD penalty the user should have the ability to disable.

If I had another two weeks to "play", I would attempt to unplug their O_DIRECT disk module and plug in this IO_URING module.
https://github.com/dshulyak/uring

My gut tells me it would enable MinIO to push writes even faster than its already stellar read performance.

Appendix

MinioDiskPrep.sh

```sh
#!/bin/sh
set -e
# Figure out where we are being run
SCRIPTPATH="$( cd "$(dirname "$0")" ; pwd -P )"
MINIO_SERVER_SCRIPT="$SCRIPTPATH/LaunchMinioServer.sh"
#
EVANS_SCSI_PREFIX='scsi-35000c500a'
MACH2_SCSI_PREFIX='scsi-36000c500a'
NYTRO_SCSI_PREFIX='scsi-35000c5003'
MACH2_WWN_PREFIX='wwn-0x6000c500a'
EVANS_WWN_PREFIX='wwn-0x5000c500a'
TATSU_WWN_PREFIX='wwn-0x5000c5009'
NYTRO_WWN_PREFIX='wwn-0x5000c5003'

#DISK_TYPE='ST10000'
DISK_STORE_TYPE='ST16000NM'
DISK_CACHE_TYPE='XS3840'
MAX_STORE_DISK_CNT=32
MAX_CACHE_DISK_CNT=6
MNT_TOP_DIR='/minio_test'
MNT_STORE_PREFIX='disk'
MNT_CACHE_PREFIX='cache'
#PRG_CHAR="•"
PRG_CHAR="·"
PAD_STR='000'
PAD_LEN=$(( $(echo $PAD_STR | wc -c) - 1 ))

CACHE_LIST=""

declare -a CACHE_DEVS
declare -a STORE_DEVS

for DRV in $(lsblk -npS -o NAME,VENDOR,MODEL,SIZE | grep "${DISK_STORE_TYPE}" | sort | awk '{print $1}' )
do
    STORE_DEVS+=(${DRV})
done
for DRV in $(lsblk -npS -o NAME,VENDOR,MODEL,SIZE | grep "${DISK_CACHE_TYPE}" | sort | awk '{print $1}' )
do
    CACHE_DEVS+=(${DRV})
done

CACHE_DEV_CNT="${#CACHE_DEVS[*]}"
STORE_DEV_CNT="${#STORE_DEVS[*]}"
echo "CacheDevCnt=$CACHE_DEV_CNT"
echo "StoreDevCnt=$STORE_DEV_CNT"

DirCleanUp() {
    # Nothing to do if we don't have the topdir.
    if [ -d "$MNT_TOP_DIR" ]
    then
        printf "Cleaning up mount point(s)\n "
        for mnt in $(mount -l  | grep "$MNT_TOP_DIR" | awk '{print $3}')
                do
                printf "$PRG_CHAR"
                umount "$mnt"
                rmdir "$mnt"
        done
        rm -rf  "$MNT_TOP_DIR"
        printf "\ndone.\n\n"
    fi
}
DirSetUp() {
    if [ ! -d "$MNT_TOP_DIR" ]
    then
        printf "Creating top level disk mount directory\n"
```

```
            mkdir "$MNT_TOP_DIR"
            printf "done.\n\n"
    fi


}
DiskPrep() {
    #printf "Disk Prep: \n "
    # for disk in $( lsblk -p -S | grep $DISK_TYPE | sort | awk '{print $1}')
    # do
    #       (dd if=/dev/zero of=$disk bs=1M count=256 2>/dev/null && printf "$PRG_CHAR" ) &
    # done
    echo "Clearing Storage Devices"
    for disk in "${STORE_DEVS[@]}"
    do
            (dd if=/dev/zero of=$disk bs=1M count=256 2>/dev/null && printf "$PRG_CHAR" ) &
    done
    wait
    printf "\ndone\n\n"
    echo "Clearing Cache Devices"
    for disk in "${CACHE_DEVS[@]}"
    do
            (dd if=/dev/zero of=$disk bs=1M count=256 2>/dev/null && printf "$PRG_CHAR" ) &
    done
    wait || exit 1
    printf "\ndone\n\n"

    printf "\nFormatting storage disks: \n "
    for disk in "${STORE_DEVS[@]}"
    do
            (mkfs.xfs -q $disk && printf "$PRG_CHAR") &
    done
    printf "\ndone\n\n"
    wait || exit 1
    printf "\nFormatting cache disks: \n "
    for disk in "${CACHE_DEVS[@]}"
    do
            (mkfs.xfs -q $disk && printf "$PRG_CHAR") &
    done
    wait || exit 1
    printf "\ndone\n\n"
}
MountStorageFileSystems() {
    printf "Mounting Storage File Systems...\n "
    [ -d "$MNT_TOP_DIR" ] || DirSetUp
    DSK_CNT=${STORE_DEV_CNT}
    if [[ ${DSK_CNT} -gt ${MAX_STORE_DISK_CNT} ]] ; then
            DSK_CNT=${MAX_STORE_DISK_CNT}
    fi
    for disk in "${STORE_DEVS[@]}"
    do
            for x in $(seq 1 $DSK_CNT)
            do
                    NUM=$(printf "$PAD_STR$x" | tail -c $PAD_LEN)
                    MNT_PATH="$MNT_TOP_DIR/${MNT_STORE_PREFIX}${NUM}"
                    if [ ! -d "$MNT_PATH" ]
                    then
                            mkdir "$MNT_PATH"
                            (mount "$disk" "$MNT_PATH" && printf "$PRG_CHAR") &
                            break
                    fi
            done
    done
    wait
    printf "\ndone\n\n"
}
MountCacheFileSystems() {
    CACHE_LIST=""
    printf "Mounting Cache File Systems...\n "
    [ -d "$MNT_TOP_DIR" ] || DirSetUp
    DSK_CNT=${STORE_DEV_CNT}
    if [[ ${DSK_CNT} -gt ${MAX_CACHE_DISK_CNT} ]] ; then
            DSK_CNT=${MAX_CACHE_DISK_CNT}
    fi
    for disk in "${CACHE_DEVS[@]}"
    do
            for x in $(seq 1 $DSK_CNT)
            do
                    NUM=$(printf "$PAD_STR$x" | tail -c $PAD_LEN)
```

```
                        MNT_PATH="$MNT_TOP_DIR/${MNT_CACHE_PREFIX}${NUM}"
                        if [ ! -d "$MNT_PATH" ]
                        then
                                mkdir "$MNT_PATH"
                                (mount "$disk" "$MNT_PATH" && printf "$PRG_CHAR") &
                                CACHE_LIST="${CACHE_LIST},${MNT_PATH}"
                                break
                        fi
                done
        done
    wait
    printf "\ndone\n\n"
}
#minio server http://minio-{1...4}:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} 2>&1 >>/var/log/minio.log
CreateMinioLauncher() {
    printf "Creating minio server launch script\n"
    disk_1="$(ls $MNT_TOP_DIR/ | sort | head -1 | awk -F "/" '{print $NF}')"
    disk_1="$(printf $disk_1 | tail -c $PAD_LEN)"
    disk_n="$(ls $MNT_TOP_DIR/ | sort | tail -1 | awk -F "/" '{print $NF}')"
    disk_n="$(printf $disk_n | tail -c $PAD_LEN)"
    cat <<-SCRIPT >$MINIO_SERVER_SCRIPT
            ulimit -n 1000000
            export MINIO_ACCESS_KEY=\${MINIO_ACCESS_KEY:=admin}
            export MINIO_SECRET_KEY=\${MINIO_SECRET_KEY:=password}
            export MINIO_ROOT_USER=\${MINIO_ACCESS_KEY:=admin}
            export MINIO_ROOT_PASSWORD=\${MINIO_SECRET_KEY:=password}
            export MINIO_CACHE_DRIVES="${CACHE_LIST:1}"
        minio server http://172.20.2.10:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} \
                            http://172.20.2.12:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} \
                            http://172.20.2.14:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} \
                            http://172.20.2.16:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} \
                            http://172.20.2.18:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} \
                            http://172.20.2.40:9000$MNT_TOP_DIR/$MNT_STORE_PREFIX{$disk_1...$disk_n} #2>&1
>>/var/log/minio.log
    SCRIPT
    chmod a+x $MINIO_SERVER_SCRIPT
    printf "done\n To Start MinIO server: $(realpath $MINIO_SERVER_SCRIPT)\n\n"
}
DirCleanUp
DirSetUp
DiskPrep
MountStorageFileSystems
MountCacheFileSystems
echo "CACHE_LIST=$CACHE_LIST"
CreateMinioLauncher
```

SetDiskScheduler

```
#!/bin/sh
set -e
# Figure out where we are being run
SCRIPTPATH="$( cd "$(dirname "$0")" ; pwd -P )"
MINIO_SERVER_SCRIPT="$SCRIPTPATH/LaunchMinioServer.sh"
#
EVANS_SCSI_PREFIX='scsi-35000c500a'
MACH2_SCSI_PREFIX='scsi-36000c500a'
NYTRO_SCSI_PREFIX='scsi-35000c5003'
MACH2_WWN_PREFIX='wwn-0x6000c500a'
EVANS_WWN_PREFIX='wwn-0x5000c500a'
TATSU_WWN_PREFIX='wwn-0x5000c5009'
NYTRO_WWN_PREFIX='wwn-0x5000c5003'

#DISK_TYPE='ST10000'
DISK_STORE_TYPE='ST16000NM'
DISK_CACHE_TYPE='XS3840'
MAX_STORE_DISK_CNT=32
MAX_CACHE_DISK_CNT=6
MNT_TOP_DIR='/minio_test'
MNT_STORE_PREFIX='disk'
MNT_CACHE_PREFIX='cache'
#PRG_CHAR="•"
PRG_CHAR="·"
PAD_STR='000'
PAD_LEN=$(( $(echo $PAD_STR | wc -c) - 1 ))

CACHE_LIST=""

OSD_READ_AHEAD=4096
OSD_SCHEDULER='none'
#OSD_SCHEDULER='deadline'
```

```
declare -a SCHEDULERS
SCHEDULERS=("none" "mq-deadline" "kyber" "bfq")

declare -a CACHE_DEVS
declare -a STORE_DEVS

for DRV in $(lsblk -npS -o NAME,VENDOR,MODEL,SIZE | grep "${DISK_STORE_TYPE}" | sort | awk '{print $1}' )
do
    STORE_DEVS+=(${DRV})
done
for DRV in $(lsblk -npS -o NAME,VENDOR,MODEL,SIZE | grep "${DISK_CACHE_TYPE}" | sort | awk '{print $1}' )
do
    CACHE_DEVS+=(${DRV})
done

CACHE_DEV_CNT="${#CACHE_DEVS[*]}"
STORE_DEV_CNT="${#STORE_DEVS[*]}"
echo "CacheDevCnt=$CACHE_DEV_CNT"
echo "StoreDevCnt=$STORE_DEV_CNT"

SetDrvQueue() {
    setting=$1
    echo "$HOSTNAME: Setting Disk Scheduler to $setting"
    for disk in "${STORE_DEVS[@]}"
    do
            DRV=$(echo $disk | awk -F '/' '{print $3}')
            echo ${setting} >/sys/block/${DRV}/queue/scheduler
    done
    wait
}
SetDrvQueue $1
```

warp.test.sh

```
#!/bin/sh


declare -a SERVER_NODES

ACCESS_KEY="admin"
SECRET_KEY="password"
SERVER_NODES=( 4u100-1a 4u100-1b 4u100-2a 4u100-2b 4u100-3a 4u100-3b )
SERVER_HOSTS="172.20.2.10:9000,172.20.2.12:9000,172.20.2.14:9000,172.20.2.16:9000,172.20.2.18:9000,172.20.2.40:9000"
CLIENT_HOSTS="172.20.2.50:8000,172.20.2.52:8000,172.20.2.54:8000,172.20.2.56:8000"

declare -a SCHEDULERS
SCHEDULERS=("none" "mq-deadline" "kyber" "bfq")


prep_for_testing() {
    for NODE in "${SERVER_NODES[@]}"
    do
            echo "Copying testmon to ${NODE}"
            scp ./testmon.sh root@${NODE}:/root/
            scp ./SetDiskScheduler.sh root@${NODE}:/root/
            ssh root@${NODE} "chmod +x /root/testmon.sh"
            ssh root@${NODE} "rm -f /root/*.log"
    done
}

sysmonitor_stop() {
    for NODE in "${SERVER_NODES[@]}"
    do
            echo "Stopping monitor on ${NODE}"
            ssh root@${NODE} "/root/testmon.sh stop dummy"
            rsync -v --remove-source-files root@${NODE}:\*.log .

    done
}
sysmonitor_start() {
    name="${1}"
    for NODE in "${SERVER_NODES[@]}"
    do
            echo "Starting monitoring on ${NODE}"
            echo ssh root@${NODE} "/root/testmon.sh start ${TEST_NAME}"
            ssh root@${NODE} "/root/testmon.sh start ${TEST_NAME}" &
    done
}
set_disk_scheduler() {
    for NODE in "${SERVER_NODES[@]}"
    do
            ssh root@${NODE} "/root/SetDiskScheduler.sh $1"
    done
}

#for OBJ_SIZE in 128KiB 512KiB 1MiB 8MiB 16MiB 32MiB 64MiB 128MiB
prep_for_testing

for OBJ_SIZE in $((128 * 1024)) \
            $((512 * 1024)) \
```

```
                $((1 *    1024 *1024)) \
                $((4 *    1024 *1024)) \
                $((16 *   1024 *1024)) \
                $((64 *   1024 *1024))
do
    echo "Object Size = ${OBJ_SIZE}"
    for CONC in 8 16 24 48 64 96 128
    #for CONC in 128 96 48 24 16  8
    do
            CONC_STR=$(printf "%03d" $CONC)

            #for OP in put get mixed delete
            for OP in put get
            do
                    for SCH in ${SCHEDULERS[*]};
                    do
                            echo "================================"
                            set_disk_scheduler $SCH
                            TEST_NAME="${OP}-${CONC_STR}-${OBJ_SIZE}-${SCH}"
                            DEL_OBJS=$(($CONC * 400))
                            OPTIONS=" "
                            OPTIONS="${OPTIONS} --access-key=${ACCESS_KEY} "
                            OPTIONS="${OPTIONS} --secret-key=${SECRET_KEY} "
                            OPTIONS="${OPTIONS} --host=${SERVER_HOSTS} "
                            OPTIONS="${OPTIONS} --warp-client=${CLIENT_HOSTS} "
                            OPTIONS="${OPTIONS} --obj.size=${OBJ_SIZE} "
                            OPTIONS="${OPTIONS} --benchdata=${TEST_NAME} "
                            OPTIONS="${OPTIONS} --duration=7m30s "
                            OPTIONS="${OPTIONS} --concurrent=${CONC} "
                            OPTIONS="${OPTIONS} --autoterm --autoterm.dur=20s "
                            OPTIONS="${OPTIONS} --quiet --noclear "
                            echo "Starting ${TEST_NAME}"
                            sysmonitor_start "${TEST_NAME}"
                            echo "Launching Warp"
                            # 1000 objectes * 4 servers * number of threads
                            case ${OP} in
                                    "delete")
                                                OPTIONS="delete ${OPTIONS} --objects=${DEL_OBJS} "
                                                ;;
                                    *)
                                                OPTIONS="${OP} ${OPTIONS}"
                                                ;;
                            esac
                            echo "warp ${OPTIONS}"
                            warp ${OPTIONS}
                            sysmonitor_stop
                            echo "Completed ${TEST_NAME}"
                            echo "------------------------------"
                    done
            done
    done
done
```

SuSE autoyast network provisioning script.

```xml
<?xml version="1.0"?>
<!DOCTYPE profile>
<profile xmlns="http://www.suse.com/1.0/yast2ns" xmlns:config="http://www.suse.com/1.0/configns">
  <add-on>
        <add_on_others config:type="list">
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Backports/SLE-15-SP2_x86_64/standard/]]></media_url>
</listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Module-Basesystem/15-SP2/x86_64/update/]]></me
dia_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Module-Containers/15-SP2/x86_64/update/]]></me
dia_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Module-Desktop-Applications/15-SP2/x86_64/upda
te/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Module-Development-Tools/15-SP2/x86_64/update/
]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Module-Packagehub-Subpackages/15-SP2/x86_64/up
date/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Module-Server-Applications/15-SP2/x86_64/updat
e/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/SLE-Product-SLES/15-SP2/x86_64/update/]]></media_u
rl> </listentry>
```

```xml
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Updates/Storage/7/x86_64/update/]]></media_url>
</listentry>
        </add_on_others>
        <add_on_products config:type="list">
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Backports/SLE-15-SP2_x86_64/product/]]></media_url>
</listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Products/SLE-Module-Basesystem/15-SP2/x86_64/product/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Products/SLE-Module-Containers/15-SP2/x86_64/product/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Products/SLE-Module-Desktop-Applications/15-SP2/x86_64/product/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Products/SLE-Module-Development-Tools/15-SP2/x86_64/product/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Products/SLE-Module-Packagehub-Subpackages/15-SP2/x86_64/product/]]></media_url> </listentry>
        <listentry>
<media_url><![CDATA[http://srmt.lyve.colo.seagate.com/repo/SUSE/Products/Storage/7/x86_64/product/]]></media_url>
</listentry>
        </add_on_products>
  </add-on>
  <bootloader>
        <global>
        <append>biosdevname=0 net.ifnames=1 console=ttyS0,115200n8 quiet crashkernel=224M,high crashkernel=72M,low
mitigations=auto</append>
        <cpu_mitigations>auto</cpu_mitigations>
        <gfxmode>auto</gfxmode>
        <hiddenmenu>false</hiddenmenu>
        <os_prober>false</os_prober>
        <secure_boot>false</secure_boot>
        <serial>serial --unit=0 --speed=115200 --parity=no --word=8</serial>
        <terminal>serial</terminal>
        <timeout config:type="integer">8</timeout>
        <trusted_grub>true</trusted_grub>
        <xen_append>console=hvc0</xen_append>
        <xen_kernel_append>console=com1 com1=115200 crashkernel=296M\&lt;4G</xen_kernel_append>
        </global>
        <loader_type>grub2-efi</loader_type>
  </bootloader>
  <deploy_image>
        <image_installation config:type="boolean">false</image_installation>
  </deploy_image>
  <firewall>
        <default_zone>public</default_zone>
        <enable_firewall config:type="boolean">true</enable_firewall>
        <log_denied_packets>off</log_denied_packets>
        <start_firewall config:type="boolean">true</start_firewall>
        <zones config:type="list">
        <zone>
        <description>Unsolicited incoming network packets are rejected. Incoming packets that are related to outgoing
network connections are accepted. Outgoing network connections are allowed.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>block</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list"/>
        <short>Block</short>
        <target>%%REJECT%%</target>
        </zone>
        <zone>
        <description>For computers in your demilitarized zone that are publicly-accessible with limited access to your
internal network. Only selected incoming connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>dmz</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list">
        <service>ssh</service>
        <service>tigervnc</service>
```

```xml
        <service>tigervnc-https</service>
        </services>
        <short>DMZ</short>
        <target>default</target>
        </zone>
        <zone>
        <description>Unsolicited incoming network packets are dropped. Incoming packets that are related to outgoing
network connections are accepted. Outgoing network connections are allowed.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>drop</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list"/>
        <short>Drop</short>
        <target>DROP</target>
        </zone>
        <zone>
        <description>For use on external networks. You do not trust the other computers on networks to not harm your
computer. Only selected incoming connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">true</masquerade>
        <name>external</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list">
        <service>ssh</service>
        </services>
        <short>External</short>
        <target>default</target>
        </zone>
        <zone>
        <description>For use in home areas. You mostly trust the other computers on networks to not harm your computer.
Only selected incoming connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>home</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list">
        <service>ssh</service>
        <service>mdns</service>
        <service>samba-client</service>
        <service>dhcpv6-client</service>
        </services>
        <short>Home</short>
        <target>default</target>
        </zone>
        <zone>
        <description>For use on internal networks. You mostly trust the other computers on the networks to not harm your
computer. Only selected incoming connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>internal</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list">
        <service>ssh</service>
        <service>mdns</service>
        <service>samba-client</service>
        <service>dhcpv6-client</service>
        </services>
        <short>Internal</short>
        <target>default</target>
        </zone>
        <zone>
        <description>For use in public areas. You do not trust the other computers on networks to not harm your
computer. Only selected incoming connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>public</name>
        <ports config:type="list">
        <port>8443/tcp</port>
        </ports>
        <protocols config:type="list"/>
        <services config:type="list">
        <service>ssh</service>
        <service>dhcpv6-client</service>
```

```xml
        </services>
        <short>Public</short>
        <target>default</target>
        </zone>
        <zone>
        <description>All network connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>trusted</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list"/>
        <short>Trusted</short>
        <target>ACCEPT</target>
        </zone>
        <zone>
        <description>For use in work areas. You mostly trust the other computers on networks to not harm your computer.
Only selected incoming connections are accepted.</description>
        <interfaces config:type="list"/>
        <masquerade config:type="boolean">false</masquerade>
        <name>work</name>
        <ports config:type="list"/>
        <protocols config:type="list"/>
        <services config:type="list">
        <service>ssh</service>
        <service>dhcpv6-client</service>
        </services>
        <short>Work</short>
        <target>default</target>
        </zone>
        </zones>
  </firewall>
  <suse_register>
        <do_registration config:type="boolean">true</do_registration>
        <install_updates config:type="boolean">true</install_updates>
        <slp_discovery config:type="boolean">false</slp_discovery>
        <reg_server>http://srmt.lyve.colo.seagate.com</reg_server>
        <!-- optionally register some add-ons -->
        <addons config:type="list">
        <addon>
        <name>sle-module-basesystem</name>
        <version>15.2</version>
        <arch>x86_64</arch>
        </addon>
        </addons>
  </suse_register>
  <general>
   <!--
        <semi-automatic config:type="list">
        <semi-automatic_entry>scc</semi-automatic_entry>
        </semi-automatic>
        -->
        <ask-list config:type="list"/>
        <mode>
        <confirm config:type="boolean">false</confirm>
        </mode>
        <proposals config:type="list"/>
        <signature-handling>
        <accept_unknown_gpg_key config:type="boolean">true</accept_unknown_gpg_key>
        <accept_non_trusted_gpg_key config:type="boolean">true</accept_non_trusted_gpg_key>
        <import_gpg_key config:type="boolean">true</import_gpg_key>
        </signature-handling>
        <storage/>
  </general>
  <groups config:type="list">
        <group> <encrypted config:type="boolean">true</encrypted> <gid>0</gid> <group_password>x</group_password>
<groupname>root</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>1</gid> <group_password>x</group_password>
<groupname>bin</groupname> <userlist>daemon</userlist> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>2</gid> <group_password>x</group_password>
<groupname>daemon</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>5</gid> <group_password>x</group_password>
<groupname>tty</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>15</gid> <group_password>x</group_password>
<groupname>shadow</groupname> <userlist>vnc</userlist> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>42</gid> <group_password>x</group_password>
<groupname>trusted</groupname> <userlist/> </group>
```

```xml
        <group> <encrypted config:type="boolean">true</encrypted> <gid>51</gid> <group_password>x</group_password>
<groupname>postfix</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>59</gid> <group_password>x</group_password>
<groupname>maildrop</groupname> <userlist>postfix</userlist> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>62</gid> <group_password>x</group_password>
<groupname>man</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>71</gid> <group_password>x</group_password>
<groupname>ntadmin</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>100</gid> <group_password>x</group_password>
<groupname>users</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>475</gid> <group_password>x</group_password>
<groupname>vnc</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>476</gid> <group_password>x</group_password>
<groupname>salt</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>477</gid> <group_password>x</group_password>
<groupname>chrony</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>478</gid> <group_password>x</group_password>
<groupname>sshd</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>479</gid> <group_password>x</group_password>
<groupname>nscd</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>480</gid> <group_password>x</group_password>
<groupname>systemd-timesync</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>481</gid> <group_password>x</group_password>
<groupname>systemd-coredump</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>482</gid> <group_password>x</group_password>
<groupname>systemd-network</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>483</gid> <group_password>x</group_password>
<groupname>systemd-journal</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>484</gid> <group_password>x</group_password>
<groupname>polkitd</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>485</gid> <group_password>x</group_password>
<groupname>video</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>486</gid> <group_password>x</group_password>
<groupname>tape</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>487</gid> <group_password>x</group_password>
<groupname>lp</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>488</gid> <group_password>x</group_password>
<groupname>kvm</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>489</gid> <group_password>x</group_password>
<groupname>input</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>490</gid> <group_password>x</group_password>
<groupname>disk</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>491</gid> <group_password>x</group_password>
<groupname>dialout</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>492</gid> <group_password>x</group_password>
<groupname>cdrom</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>493</gid> <group_password>x</group_password>
<groupname>audio</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>494</gid> <group_password>x</group_password>
<groupname>utmp</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>495</gid> <group_password>x</group_password>
<groupname>lock</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>496</gid> <group_password>x</group_password>
<groupname>kmem</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>497</gid> <group_password>x</group_password>
<groupname>wheel</groupname> <userlist>johns</userlist> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>498</gid> <group_password>!</group_password>
<groupname>mail</groupname> <userlist>postfix</userlist> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>499</gid> <group_password>x</group_password>
<groupname>messagebus</groupname> <userlist/> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>65533</gid> <group_password>x</group_password>
<groupname>nogroup</groupname> <userlist>nobody</userlist> </group>
        <group> <encrypted config:type="boolean">true</encrypted> <gid>65534</gid> <group_password>x</group_password>
<groupname>nobody</groupname> <userlist/> </group>
  </groups>
  <host>
        <hosts config:type="list">
        <hosts_entry> <host_address>127.0.0.1</host_address> <names config:type="list"> <name>localhost</name> </names>
</hosts_entry>
        <hosts_entry> <host_address>::1</host_address> <names config:type="list"> <name>localhost ipv6-localhost
ipv6-loopback</name> </names> </hosts_entry>
        <hosts_entry> <host_address>fe00::0</host_address> <names config:type="list"> <name>ipv6-localnet</name>
</names> </hosts_entry>
        <hosts_entry> <host_address>ff00::0</host_address> <names config:type="list"> <name>ipv6-mcastprefix</name>
</names> </hosts_entry>
        <hosts_entry> <host_address>ff02::1</host_address> <names config:type="list"> <name>ipv6-allnodes</name>
</names> </hosts_entry>
```

```xml
        <hosts_entry> <host_address>ff02::2</host_address> <names config:type="list"> <name>ipv6-allrouters</name>
</names> </hosts_entry>
        <hosts_entry> <host_address>ff02::3</host_address> <names config:type="list"> <name>ipv6-allhosts</name>
</names> </hosts_entry>
        </hosts>
  </host>
  <kdump>
        <add_crash_kernel config:type="boolean">true</add_crash_kernel>
        <crash_kernel config:type="list">
        <listentry>224M,high</listentry>
        <listentry>72M,low</listentry>
        </crash_kernel>
        <crash_xen_kernel>296M\&lt;4G</crash_xen_kernel>
        <general>
        <KDUMPTOOL_FLAGS/>
        <KDUMP_COMMANDLINE/>
        <KDUMP_COMMANDLINE_APPEND/>
        <KDUMP_CONTINUE_ON_ERROR>true</KDUMP_CONTINUE_ON_ERROR>
        <KDUMP_COPY_KERNEL>yes</KDUMP_COPY_KERNEL>
        <KDUMP_CPUS/>
        <KDUMP_DUMPFORMAT>lzo</KDUMP_DUMPFORMAT>
        <KDUMP_DUMPLEVEL>31</KDUMP_DUMPLEVEL>
        <KDUMP_FREE_DISK_SIZE>64</KDUMP_FREE_DISK_SIZE>
        <KDUMP_HOST_KEY/>
        <KDUMP_IMMEDIATE_REBOOT>yes</KDUMP_IMMEDIATE_REBOOT>
        <KDUMP_KEEP_OLD_DUMPS>5</KDUMP_KEEP_OLD_DUMPS>
        <KDUMP_KERNELVER/>
        <KDUMP_NETCONFIG>auto</KDUMP_NETCONFIG>
        <KDUMP_NET_TIMEOUT>30</KDUMP_NET_TIMEOUT>
        <KDUMP_NOTIFICATION_CC/>
        <KDUMP_NOTIFICATION_TO/>
        <KDUMP_POSTSCRIPT/>
        <KDUMP_PRESCRIPT/>
        <KDUMP_REQUIRED_PROGRAMS/>
        <KDUMP_SAVEDIR>/var/crash</KDUMP_SAVEDIR>
        <KDUMP_SMTP_PASSWORD/>
        <KDUMP_SMTP_SERVER/>
        <KDUMP_SMTP_USER/>
        <KDUMP_TRANSFER/>
        <KDUMP_VERBOSE>3</KDUMP_VERBOSE>
        <KEXEC_OPTIONS/>
        </general>
  </kdump>
  <keyboard>
        <keymap>english-us</keymap>
  </keyboard>
  <language>
        <language>en_US</language>
        <languages>en_US</languages>
  </language>
  <login_settings/>
  <networking>
        <dhcp_options>
        <dhclient_client_id/>
        <dhclient_hostname_option>AUTO</dhclient_hostname_option>
        </dhcp_options>
        <dns>
        <dhcp_hostname config:type="boolean">true</dhcp_hostname>
        <resolv_conf_policy>auto</resolv_conf_policy>
        </dns>
        <interfaces config:type="list">
        <interface> <name>eno1</name>            <bootproto>dhcp</bootproto>
<dhclient_set_hostname>no</dhclient_set_hostname>   <startmode>auto</startmode> <mtu>1500</mtu></interface>
        <interface> <name>enp2s0</name>          <bootproto>dhcp</bootproto>
<dhclient_set_hostname>no</dhclient_set_hostname>   <startmode>auto</startmode> <mtu>1500</mtu></interface>
        <interface> <name>enp175s0f0</name>      <bootproto>dhcp</bootproto>
<dhclient_set_hostname>yes</dhclient_set_hostname>  <startmode>auto</startmode> <mtu>9000</mtu></interface>
        <interface> <name>enp175s0f1</name>      <bootproto>dhcp</bootproto>
<dhclient_set_hostname>no</dhclient_set_hostname>   <startmode>auto</startmode> <mtu>9000</mtu></interface>
        <interface> <name>enP65539p1s0f0</name> <bootproto>dhcp</bootproto>
<dhclient_set_hostname>yes</dhclient_set_hostname>  <startmode>auto</startmode> <mtu>9000</mtu></interface>
        <interface> <name>enP65539p1s0f1</name> <bootproto>dhcp</bootproto>
<dhclient_set_hostname>no</dhclient_set_hostname>   <startmode>auto</startmode> <mtu>9000</mtu></interface>
        </interfaces>
        <ipv6 config:type="boolean">true</ipv6>
        <keep_install_network config:type="boolean">true</keep_install_network>
        <managed config:type="boolean">false</managed>
        <routing>
```

```xml
            <ipv4_forward config:type="boolean">false</ipv4_forward>
            <ipv6_forward config:type="boolean">false</ipv6_forward>
            <routes config:type="list">
            <route>
            <destination>default</destination>
            <device>-</device>
            <gateway>172.16.16.1</gateway>
            <netmask>-</netmask>
            </route>
            </routes>
            </routing>
    </networking>
    <nis>
            <netconfig_policy>auto</netconfig_policy>
            <nis_broadcast config:type="boolean">false</nis_broadcast>
            <nis_broken_server config:type="boolean">false</nis_broken_server>
            <nis_domain/>
            <nis_local_only config:type="boolean">false</nis_local_only>
            <nis_options/>
            <nis_other_domains config:type="list"/>
            <nis_servers config:type="list"/>
            <slp_domain/>
            <start_autofs config:type="boolean">false</start_autofs>
            <start_nis config:type="boolean">false</start_nis>
    </nis>
    <ntp-client>
            <ntp_policy><![CDATA[auto]]></ntp_policy>
            <ntp_servers config:type="list">
            <ntp_server>
            <address>time.seagate.com</address>
            <iburst config:type="boolean">true</iburst>
            <offline config:type="boolean">false</offline>
            </ntp_server>
            </ntp_servers>
            <ntp_sync>systemd</ntp_sync>
    </ntp-client>
    <partitioning config:type="list">
            <drive>
            <device>/dev/disk/by-path/pci-0000:00:17.0-ata-1</device>
 <!--
            <device>/dev/disk/by-path/pci-0000:5e:00.0-sas-phy0-lun-0</device>
            <device>/dev/disk/by-path/pci-0000:00:11.5-ata-2</device>
 -->
            <disklabel>gpt</disklabel>
            <enable_snapshots config:type="boolean">true</enable_snapshots>
            <initialize config:type="boolean">false</initialize>
            <partitions config:type="list">
            <partition>
            <create config:type="boolean">true</create>
            <filesystem config:type="symbol">vfat</filesystem>
            <format config:type="boolean">true</format>
            <mount>/boot/efi</mount>
            <mountby config:type="symbol">uuid</mountby>
            <partition_id config:type="integer">259</partition_id>
            <partition_nr config:type="integer">1</partition_nr>
            <resize config:type="boolean">false</resize>
            <size>524288000</size>
            </partition>
            <partition>
            <create config:type="boolean">true</create>
            <format config:type="boolean">false</format>
            <partition_id config:type="integer">263</partition_id>
            <partition_nr config:type="integer">2</partition_nr>
            <resize config:type="boolean">false</resize>
            <size>1G</size>
            </partition>
            <partition>
            <create config:type="boolean">true</create>
            <create_subvolumes config:type="boolean">true</create_subvolumes>
            <filesystem config:type="symbol">btrfs</filesystem>
            <format config:type="boolean">true</format>
            <mount>/</mount>
            <mountby config:type="symbol">uuid</mountby>
            <partition_id config:type="integer">131</partition_id>
            <partition_nr config:type="integer">2</partition_nr>
            <resize config:type="boolean">false</resize>
            <size>127G</size>
            <subvolumes config:type="list">
```

```xml
                <subvolume> <copy_on_write config:type="boolean">false</copy_on_write> <path>var</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>boot/grub2/i386-pc</path>
</subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>boot/grub2/x86_64-efi</path>
</subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>home</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>opt</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>root</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>srv</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>srv</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>tmp</path> </subvolume>
                <subvolume> <copy_on_write config:type="boolean">true</copy_on_write> <path>usr/local</path> </subvolume>
                </subvolumes>
                <subvolumes_prefix><![CDATA[@]]></subvolumes_prefix>
                </partition>
                <partition>
                <create config:type="boolean">true</create>
                <filesystem config:type="symbol">swap</filesystem>
                <format config:type="boolean">true</format>
                <mount>swap</mount>
                <mountby config:type="symbol">uuid</mountby>
                <partition_id config:type="integer">130</partition_id>
                <partition_nr config:type="integer">4</partition_nr>
                <resize config:type="boolean">false</resize>
                <size>64G</size>
                </partition>
                </partitions>
                <type config:type="symbol">CT_DISK</type>
                <use>all</use>
                </drive>
 </partitioning>
  <printer>
                <client_conf_content>
                <file_contents><![CDATA[# CUPS client configuration file (optional).

# You may use /etc/cups/client.conf (system wide)
# or ~/.cups/client.conf (per user).
# For more information see "man 5 client.conf".

# The ServerName directive specifies the remote server
# that is to be used for all client operations. That is, it
# redirects all client requests directly to that remote server
# so that a local running cupsd is not used in this case.
# The default is to use the local server ("localhost") or domain socket.
# Only one ServerName directive may appear.
# If multiple names are present, only the last one is used.
# The default port number is 631 but can be overridden by adding
# a colon followed by the desired port number.
# The default IPP version is 2.0 but can be overridden by adding
# a slash followed by version=V where V is 1.0 or 1.1 or 2.0 or 2.1 or 2.2.
# IPP version 2.0 does do not work with CUPS 1.3 or older servers.
# If an CUPS 1.3 or older server is used, its older IPP version
# must be specified as .../version=1.1 or .../version=1.0.

# Examples:
# ServerName sever.example.com
# ServerName 192.0.2.10
# ServerName sever.example.com:8631
# ServerName older.server.example.com/version=1.1
# ServerName older.server.example.com:8631/version=1.1

]]></file_contents>
                </client_conf_content>
                <cupsd_conf_content>
                <file_contents><![CDATA[#
# Configuration file for the CUPS scheduler.  See "man cupsd.conf" for a
# complete description of this file.
#

# Log general information in error_log - change "warn" to "debug"
# for troubleshooting...
LogLevel warn
PageLogFormat

# Only listen for connections from the local machine.
Listen localhost:631
Listen /run/cups/cups.sock
```

```
# Show shared printers on the local network.
Browsing On
BrowseLocalProtocols dnssd

# Default authentication type, when authentication is required...
DefaultAuthType Basic

# Web interface setting...
WebInterface Yes

# Restrict access to the server...
<Location />
  Order allow,deny
</Location>

# Restrict access to the admin pages...
<Location /admin>
  Order allow,deny
</Location>

# Restrict access to configuration files...
<Location /admin/conf>
  AuthType Default
  Require user @SYSTEM
  Order allow,deny
</Location>

# Restrict access to log files...
<Location /admin/log>
  AuthType Default
  Require user @SYSTEM
  Order allow,deny
</Location>

# Set the default printer/job policies...
<Policy default>
  # Job/subscription privacy...
  JobPrivateAccess default
  JobPrivateValues default
  SubscriptionPrivateAccess default
  SubscriptionPrivateValues default

  # Job-related operations must be done by the owner or an administrator...
  <Limit Create-Job Print-Job Print-URI Validate-Job>
          Order deny,allow
  </Limit>

  <Limit Send-Document Send-URI Hold-Job Release-Job Restart-Job Purge-Jobs Set-Job-Attributes Create-Job-Subscription
Renew-Subscription Cancel-Subscription Get-Notifications Reprocess-Job Cancel-Current-Job Suspend-Current-Job Resume-Job
Cancel-My-Jobs Close-Job CUPS-Move-Job CUPS-Get-Document>
          Require user @OWNER @SYSTEM
          Order deny,allow
  </Limit>

  # All administration operations require an administrator to authenticate...
  <Limit CUPS-Add-Modify-Printer CUPS-Delete-Printer CUPS-Add-Modify-Class CUPS-Delete-Class CUPS-Set-Default
CUPS-Get-Devices>
          AuthType Default
          Require user @SYSTEM
          Order deny,allow
  </Limit>

  # All printer operations require a printer operator to authenticate...
  <Limit Pause-Printer Resume-Printer Enable-Printer Disable-Printer Pause-Printer-After-Current-Job Hold-New-Jobs
Release-Held-New-Jobs Deactivate-Printer Activate-Printer Restart-Printer Shutdown-Printer Startup-Printer Promote-Job
Schedule-Job-After Cancel-Jobs CUPS-Accept-Jobs CUPS-Reject-Jobs>
          AuthType Default
          Require user @SYSTEM
          Order deny,allow
  </Limit>

  # Only the owner or an administrator can cancel or authenticate a job...
  <Limit Cancel-Job CUPS-Authenticate-Job>
          Require user @OWNER @SYSTEM
          Order deny,allow
  </Limit>

  <Limit All>
```

```
        Order deny,allow
  </Limit>
</Policy>

# Set the authenticated printer/job policies...
<Policy authenticated>
  # Job/subscription privacy...
  JobPrivateAccess default
  JobPrivateValues default
  SubscriptionPrivateAccess default
  SubscriptionPrivateValues default

  # Job-related operations must be done by the owner or an administrator...
  <Limit Create-Job Print-Job Print-URI Validate-Job>
          AuthType Default
          Order deny,allow
  </Limit>

  <Limit Send-Document Send-URI Hold-Job Release-Job Restart-Job Purge-Jobs Set-Job-Attributes Create-Job-Subscription
Renew-Subscription Cancel-Subscription Get-Notifications Reprocess-Job Cancel-Current-Job Suspend-Current-Job Resume-Job
Cancel-My-Jobs Close-Job CUPS-Move-Job CUPS-Get-Document>
          AuthType Default
          Require user @OWNER @SYSTEM
          Order deny,allow
  </Limit>

  # All administration operations require an administrator to authenticate...
  <Limit CUPS-Add-Modify-Printer CUPS-Delete-Printer CUPS-Add-Modify-Class CUPS-Delete-Class CUPS-Set-Default>
          AuthType Default
          Require user @SYSTEM
          Order deny,allow
  </Limit>

  # All printer operations require a printer operator to authenticate...
  <Limit Pause-Printer Resume-Printer Enable-Printer Disable-Printer Pause-Printer-After-Current-Job Hold-New-Jobs
Release-Held-New-Jobs Deactivate-Printer Activate-Printer Restart-Printer Shutdown-Printer Startup-Printer Promote-Job
Schedule-Job-After Cancel-Jobs CUPS-Accept-Jobs CUPS-Reject-Jobs>
          AuthType Default
          Require user @SYSTEM
          Order deny,allow
  </Limit>

  # Only the owner or an administrator can cancel or authenticate a job...
  <Limit Cancel-Job CUPS-Authenticate-Job>
          AuthType Default
          Require user @OWNER @SYSTEM
          Order deny,allow
  </Limit>

  <Limit All>
          Order deny,allow
  </Limit>
</Policy>

# Set the kerberized printer/job policies...
<Policy kerberos>
  # Job/subscription privacy...
  JobPrivateAccess default
  JobPrivateValues default
  SubscriptionPrivateAccess default
  SubscriptionPrivateValues default

  # Job-related operations must be done by the owner or an administrator...
  <Limit Create-Job Print-Job Print-URI Validate-Job>
          AuthType Negotiate
          Order deny,allow
  </Limit>

  <Limit Send-Document Send-URI Hold-Job Release-Job Restart-Job Purge-Jobs Set-Job-Attributes Create-Job-Subscription
Renew-Subscription Cancel-Subscription Get-Notifications Reprocess-Job Cancel-Current-Job Suspend-Current-Job Resume-Job
Cancel-My-Jobs Close-Job CUPS-Move-Job CUPS-Get-Document>
          AuthType Negotiate
          Require user @OWNER @SYSTEM
          Order deny,allow
  </Limit>

  # All administration operations require an administrator to authenticate...
  <Limit CUPS-Add-Modify-Printer CUPS-Delete-Printer CUPS-Add-Modify-Class CUPS-Delete-Class CUPS-Set-Default>
```

```
        AuthType Default
        Require user @SYSTEM
        Order deny,allow
  </Limit>

  # All printer operations require a printer operator to authenticate...
  <Limit Pause-Printer Resume-Printer Enable-Printer Disable-Printer Pause-Printer-After-Current-Job Hold-New-Jobs
Release-Held-New-Jobs Deactivate-Printer Activate-Printer Restart-Printer Shutdown-Printer Startup-Printer Promote-Job
Schedule-Job-After Cancel-Jobs CUPS-Accept-Jobs CUPS-Reject-Jobs>
        AuthType Default
        Require user @SYSTEM
        Order deny,allow
  </Limit>

  # Only the owner or an administrator can cancel or authenticate a job...
  <Limit Cancel-Job CUPS-Authenticate-Job>
        AuthType Negotiate
        Require user @OWNER @SYSTEM
        Order deny,allow
  </Limit>

  <Limit All>
        Order deny,allow
  </Limit>
</Policy>


# The policy below is added by SUSE during build of our cups package.
# The policy 'allowallforanybody' is totally open and insecure and therefore
# it can only be used within an internal network where only trused users exist
# and where the cupsd is not accessible at all from any external host, see
# http://en.opensuse.org/SDB:CUPS_and_SANE_Firewall_settings
# Have in mind that any user who is allowed to do printer admin tasks
# can change the print queues as he likes - e.g. send copies of confidental
# print jobs from an internal network to any external destination, see
# http://en.opensuse.org/SDB:CUPS_in_a_Nutshell
# For documentation regarding 'Managing Operation Policies' see
# http://www.cups.org/documentation.php/doc-1.7/policies.html
<Policy allowallforanybody>
  # Allow anybody to access job's private values:
  JobPrivateAccess all
  # Make none of the job values to be private:
  JobPrivateValues none
  # Allow anybody to access subscription's private values:
  SubscriptionPrivateAccess all
  # Make none of the subscription values to be private:
  SubscriptionPrivateValues none
  # Allow anybody to do all IPP operations:
  # Currently the IPP operations Validate-Job Cancel-Jobs Cancel-My-Jobs Close-Job CUPS-Get-Document
  # must be additionally exlicitly specified because those IPP operations are not included
  # in the "All" wildcard value - otherwise cupsd prints error messages of the form
  # "No limit for Validate-Job defined in policy allowallforanybody and no suitable template found."
  <Limit Validate-Job Cancel-Jobs Cancel-My-Jobs Close-Job CUPS-Get-Document>
        Order deny,allow
        Allow from all
  </Limit>
  # Since CUPS > 1.5.4 the "All" wildcard value must be specified separately,
  # otherwise clients like "lpstat -p" just hang up,
  # see https://bugzilla.opensuse.org/show_bug.cgi?id=936309
  # and https://www.cups.org/str.php?L4659
  <Limit All>
        Order deny,allow
        Allow from all
  </Limit>
</Policy>
# Explicitly set the CUPS 'default' policy to be used by default:
DefaultPolicy default

]]></file_contents>
        </cupsd_conf_content>
  </printer>
  <proxy>
        <enabled config:type="boolean">false</enabled>
        <ftp_proxy/>
        <http_proxy/>
        <https_proxy/>
        <no_proxy>localhost,127.0.0.1</no_proxy>
        <proxy_password/>
        <proxy_user/>
```

```xml
        </proxy>
        <report>
                <errors>
                <log config:type="boolean">true</log>
                <show config:type="boolean">true</show>
                <timeout config:type="integer">0</timeout>
                </errors>
                <messages>
                <log config:type="boolean">true</log>
                <show config:type="boolean">true</show>
                <timeout config:type="integer">0</timeout>
                </messages>
                <warnings>
                <log config:type="boolean">true</log>
                <show config:type="boolean">true</show>
                <timeout config:type="integer">0</timeout>
                </warnings>
                <yesno_messages>
                <log config:type="boolean">true</log>
                <show config:type="boolean">true</show>
                <timeout config:type="integer">0</timeout>
                </yesno_messages>
        </report>
        <security>
                <console_shutdown>reboot</console_shutdown>
                <cracklib_dict_path>/usr/lib/cracklib_dict</cracklib_dict_path>
                <disable_restart_on_update>no</disable_restart_on_update>
                <disable_stop_on_removal>no</disable_stop_on_removal>
                <extra_services>insecure</extra_services>
                <fail_delay>3</fail_delay>
                <gid_max>60000</gid_max>
                <gid_min>1000</gid_min>
                <hibernate_system>active_console</hibernate_system>
                <kernel.sysrq>184</kernel.sysrq>
                <mandatory_services>secure</mandatory_services>
                <net.ipv4.ip_forward>0</net.ipv4.ip_forward>
                <net.ipv4.tcp_syncookies>0</net.ipv4.tcp_syncookies>
                <net.ipv6.conf.all.forwarding>0</net.ipv6.conf.all.forwarding>
                <pass_max_days>99999</pass_max_days>
                <pass_min_days>0</pass_min_days>
                <pass_min_len>5</pass_min_len>
                <pass_warn_age>7</pass_warn_age>
                <passwd_encryption>sha512</passwd_encryption>
                <passwd_remember_history>0</passwd_remember_history>
                <passwd_use_cracklib>yes</passwd_use_cracklib>
                <permission_security>easy</permission_security>
                <run_updatedb_as>nobody</run_updatedb_as>
                <smtpd_listen_remote>no</smtpd_listen_remote>
                <sys_gid_max>499</sys_gid_max>
                <sys_gid_min>100</sys_gid_min>
                <sys_uid_max>499</sys_uid_max>
                <sys_uid_min>100</sys_uid_min>
                <syslog_on_no_error>no</syslog_on_no_error>
                <systohc>yes</systohc>
                <uid_max>60000</uid_max>
                <uid_min>1000</uid_min>
                <useradd_cmd>/usr/sbin/useradd.local</useradd_cmd>
                <userdel_postcmd>/usr/sbin/userdel-post.local</userdel_postcmd>
                <userdel_precmd>/usr/sbin/userdel-pre.local</userdel_precmd>
        </security>
        <services-manager>
                <default_target>graphical</default_target>
                <services>
                <disable config:type="list"/>
                <enable config:type="list">
                <service>YaST2-Firstboot</service>
                <service>YaST2-Second-Stage</service>
                <service>apparmor</service>
                <service>auditd</service>
                <service>klog</service>
                <service>btrfsmaintenance-refresh</service>
                <service>cron</service>
                <service>firewalld</service>
                <service>wickedd-auto4</service>
                <service>wickedd-dhcp4</service>
                <service>wickedd-dhcp6</service>
                <service>wickedd-nanny</service>
                <service>display-manager</service>
```

```xml
                <service>getty@tty1</service>
                <service>haveged</service>
                <service>irqbalance</service>
                <service>iscsi</service>
                <service>issue-generator</service>
                <service>kbdsettings</service>
                <service>kdump</service>
                <service>kdump-early</service>
                <service>lvm2-monitor</service>
                <service>wicked</service>
                <service>nscd</service>
                <service>postfix</service>
                <service>purge-kernels</service>
                <service>rollback</service>
                <service>rsyslog</service>
                <service>salt-minion</service>
                <service>serial-getty@ttyS0</service>
                <service>smartd</service>
                <service>sshd</service>
                <service>vncmanager</service>
                </enable>
                <on_demand config:type="list">
                <listentry>iscsid</listentry>
                </on_demand>
                </services>
        </services-manager>
        <software>
                <image/>
                <install_recommended config:type="boolean">true</install_recommended>
                <instsource/>
                <packages config:type="list">
                <!-- <package>sle-module-server-applications-release</package> -->
                <package>autoyast2-installation</package>
                <package>autoyast2</package>
                <package>biosdevname</package>
                <package>btrfsprogs</package>
                <package>dosfstools</package>
                <package>e2fsprogs</package>
                <package>firewalld</package>
                <package>glibc</package>
                <package>grub2</package>
                <package>irqbalance</package>
                <package>kdump</package>
                <package>kexec-tools</package>
                <package>numactl</package>
                <package>openssh</package>
                <package>salt-minion</package>
                <package>ses-release</package>
                <package>sle-module-basesystem-release</package>
                <package>snapper</package>
                <package>tmux</package>
                <package>vim-data-common</package>
                <package>vim-data</package>
                <package>vim</package>
                <package>vncmanager</package>
                <package>wicked</package>
                <package>xorg-x11-Xvnc-module</package>
                <package>xorg-x11-Xvnc-novnc</package>
                <package>xorg-x11-Xvnc</package>
                <package>xorg-x11-driver-video</package>
                <package>xorg-x11-essentials</package>
                <package>xorg-x11-fonts-converted</package>
                <package>xorg-x11-fonts-core</package>
                <package>xorg-x11-fonts-legacy</package>
                <package>xorg-x11-fonts</package>
                <package>xorg-x11-server-extra</package>
                <package>xorg-x11-server</package>
                <package>xorg-x11</package>
                <package>yast2-add-on</package>
                <package>yast2-bootloader</package>
                <package>yast2-country</package>
                <package>yast2-firewall</package>
                <package>yast2-installation</package>
                <package>yast2-network</package>
                <package>yast2-nis-client</package>
                <package>yast2-ntp-client</package>
                <package>yast2-printer</package>
                <package>yast2-proxy</package>
```

```xml
                    <package>yast2-services-manager</package>
                    <package>yast2-tftp-server</package>
                    <package>yast2-users</package>
                    </packages>
                    <patterns config:type="list">
                    <pattern>apparmor</pattern>
                    <pattern>base</pattern>
                    <pattern>basic_desktop</pattern>
                    <pattern>enhanced_base</pattern>
                    <pattern>minimal_base</pattern>
                    <pattern>x11</pattern>
                    <pattern>x11_yast</pattern>
                    <pattern>yast2_basis</pattern>
                    </patterns>
                    <products config:type="list">
                    <product>SLES</product>
                    </products>
            </software>
            <ssh_import>
                    <copy_config config:type="boolean">false</copy_config>
                    <import config:type="boolean">false</import>
            </ssh_import>
            <tftp-server>
                    <start_tftpd config:type="boolean">false</start_tftpd>
            </tftp-server>
            <timezone>
                    <hwclock>UTC</hwclock>
                    <timezone>America/Denver</timezone>
            </timezone>
            <user_defaults>
                    <expire/>
                    <group>100</group>
                    <groups/>
                    <home>/home</home>
                    <inactive>-1</inactive>
                    <no_groups config:type="boolean">true</no_groups>
                    <shell>/bin/bash</shell>
                    <skel>/etc/skel</skel>
                    <umask>022</umask>
            </user_defaults>
            <users config:type="list">
                    <user>
                    <fullname>root</fullname>
                    <username>root</username>
                    <shell>/bin/bash</shell>
                    <uid>0</uid>
                    <gid>0</gid>
                    <home>/root</home>
                    <home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
                    <authorized_keys config:type="list">
                    <authorized_key>ssh-rsa
AAAAB3NzaC1yc2EAAAABIwAAAQEAsXkbk6ZNngBl5AyL6mAtVQkbh4wIAKYEmF7mZ/A7BjDqvbV4xuZW17/yxMtsYRKyYJce8zi3IOxPv9JKgNzkduGJKkdQng
xCzCHdiXBaQrpD+SKXHU0X8Po2gd4zOs5urhxyKt0R5R6xTc2z34fg88PVxD0xo50e8Gela63B6s2MuUCRmgR8EQXnBz4G0Uspd97nkr0H6g6wq+3WKJ4evdNG
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<home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
<password_settings>
<expire/>
<flag/>
<inact/>
<max>99999</max>
<min>0</min>
<warn>7</warn>
</password_settings>
<shell>/sbin/nologin</shell>
<uid>13</uid>
<user_password>!</user_password>
<username>man</username>
</user>
<user>
<encrypted config:type="boolean">true</encrypted>
<fullname>user for VNC</fullname>
<gid>475</gid>
<home>/var/lib/empty</home>
<home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
<password_settings>
<expire/>
<flag/>
<inact/>
<max>99999</max>
<min>0</min>
<warn>7</warn>
</password_settings>
<shell>/sbin/nologin</shell>
<uid>473</uid>
<user_password>!</user_password>
<username>vnc</username>
</user>
<user>
<encrypted config:type="boolean">true</encrypted>
<fullname>bin</fullname>
<gid>1</gid>
<home>/bin</home>
<home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
<password_settings>
<expire/>
<flag/>
<inact/>
<max>99999</max>
<min>0</min>
<warn>7</warn>
</password_settings>
<shell>/sbin/nologin</shell>
<uid>1</uid>
<user_password>!</user_password>
<username>bin</username>
</user>
<user>
<encrypted config:type="boolean">true</encrypted>
<fullname>systemd Network Management</fullname>
<gid>482</gid>
<home>/</home>
<home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
<password_settings>
<expire/>
<flag/>
<inact/>
<max>99999</max>
<min>0</min>
<warn>7</warn>
</password_settings>
<shell>/sbin/nologin</shell>
<uid>482</uid>
<user_password>!!</user_password>
```

```xml
        <username>systemd-network</username>
      </user>
      <user>
      <encrypted config:type="boolean">true</encrypted>
      <fullname>systemd Time Synchronization</fullname>
      <gid>480</gid>
      <home>/</home>
      <home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
      <password_settings>
      <expire/>
      <flag/>
      <inact/>
      <max>99999</max>
      <min>0</min>
      <warn>7</warn>
      </password_settings>
      <shell>/sbin/nologin</shell>
      <uid>480</uid>
      <user_password>!!</user_password>
      <username>systemd-timesync</username>
      </user>
      <user>
      <encrypted config:type="boolean">true</encrypted>
      <fullname>NFS statd daemon</fullname>
      <gid>65533</gid>
      <home>/var/lib/nfs</home>
      <home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
      <password_settings>
      <expire/>
      <flag/>
      <inact/>
      <max>99999</max>
      <min>0</min>
      <warn>7</warn>
      </password_settings>
      <shell>/sbin/nologin</shell>
      <uid>476</uid>
      <user_password>!</user_password>
      <username>statd</username>
      </user>
      <user>
      <encrypted config:type="boolean">true</encrypted>
      <fullname>User for nscd</fullname>
      <gid>479</gid>
      <home>/run/nscd</home>
      <home_btrfs_subvolume config:type="boolean">false</home_btrfs_subvolume>
      <password_settings>
      <expire/>
      <flag/>
      <inact/>
      <max/>
      <min/>
      <warn/>
      </password_settings>
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      <uid>479</uid>
      <user_password>!</user_password>
      <username>nscd</username>
      </user>
  </users>
</profile>
```