SC22
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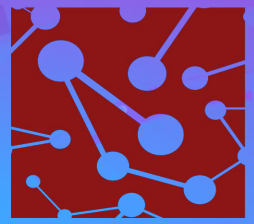
Overcoming HPC System Management Challenges: An Open Source Approach



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Outline

- Fir/Oak File Systems
- sasutils
- Oak Storage Lifecycle
- del_ost
- ibswinfo
- Slurm SPANK GPU Plugin

Lustre storage systems

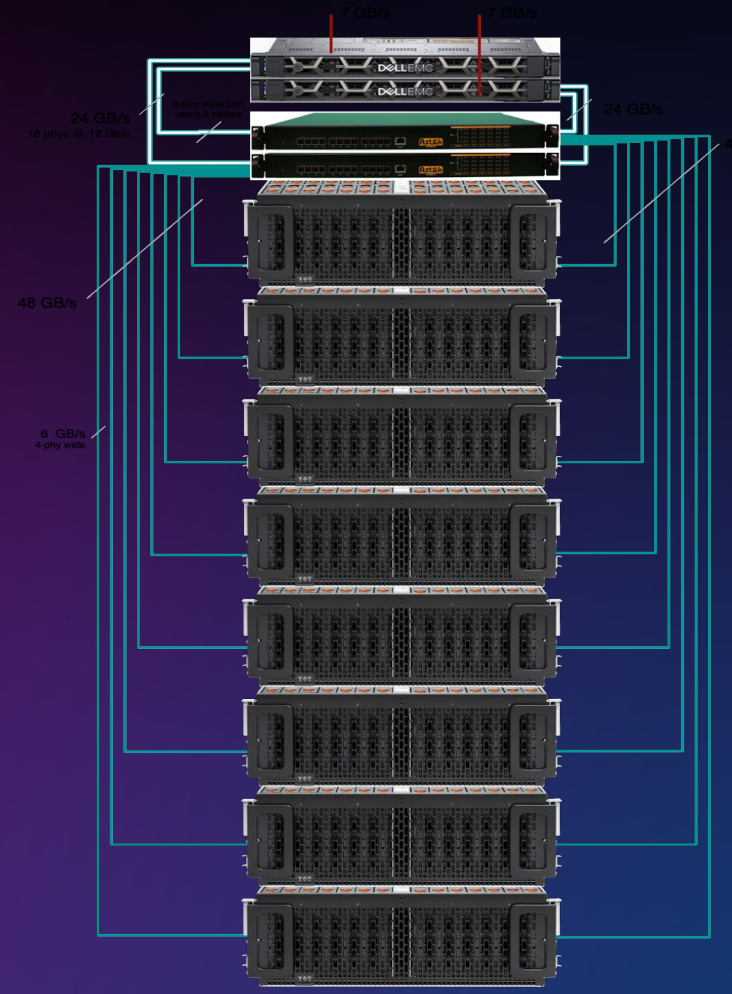
- Fir
  - Sherlock's scratch filesystem
  - High-performance storage system for temporary data
  - 4 MDTs, 96 OSTs, 960 hard drives in 8 I/O cells, 6 PB usable
- Oak
  - Global, capacity-oriented Lustre filesystem
  - 6 MDTs, 462 OSTs, 4,704 hard drives in 7 I/O cells, 52 PB usable total

sasutils

sasutils

- Display SAS fabric tree and provide aggregated view of devices
- sas_discover, sas_devices, sas_counters, ses_report
- Based on sysfs (and also sg3_utils and smp_utils)
- Support SES Enclosure Nickname

- Open source, available at https://github.com/stanford-rc/sasutils
- Published in EPEL 7, EPEL 8 and soon in EPEL 9
- Or use “pip install sasutils”



sasutils

- sas_devices

```
$ sas_devices
Found 2 SAS hosts
Found 4 SAS expanders
Found 1 enclosure groups
Enclosure group: [io1-jbod1-0][io1-jbod1-1]
NUM        VENDOR       MODEL    REV  PATHS
 60 x      SEAGATE ST8000NM0075   E002      2
Total: 60 block devices in enclosure group
```

sasutils

- sas_devices
- sas_discover

```
$ sas_discover -v
oak-io1-s1
|--host35 SAS9300-8e
|  `--8x--expander-35:0 ASTEK
|        |--1x--end_device-35:0:0
|        |      `--enclosure io1-sassw1 ASTEK
|        `--4x--expander-35:1 QCT
|           |-- 60 x end_device -- disk
|           `--  1 x end_device -- enclosure io1-jbod1-0 QCT
`--host36 SAS9300-8e
   `--8x--expander-36:0 ASTEK
         |--1x--end_device-36:0:0
         |      `--enclosure io1-sassw2 ASTEK
         `--4x--expander-36:1 QCT
            |-- 60 x end_device -- disk
            `--  1 x end_device -- enclosure io1-jbod1-1 QCT
```

sasutils

- sas_devices
- sas_discover
- sas_counters

```
$ sas_counters
...
oak-io1-s1.SAS9300-8e...Switch184.io1-sassw1.JB4602_SIM_0.io1-jbod1-0.bays.41.ST8000NM0075...ioerr_cnt 2 1487457378
oak-io1-s1.SAS9300-8e...Switch184.io1-sassw1.JB4602_SIM_0.io1-jbod1-0.bays.41.ST8000NM0075...iodone_cnt 7154904 1487457378
oak-io1-s1.SAS9300-8e...Switch184.io1-sassw1.JB4602_SIM_0.io1-jbod1-0.bays.41.ST8000NM0075...iorequest_cnt 7154906 1487457378
...
oak-io1-s1.SAS9300-8e.0x500605b00ab05678.Switch184.io1-sassw2.phys.15.invalid_dword_count 5 1487457378
oak-io1-s1.SAS9300-8e.0x500605b00ab05678.Switch184.io1-sassw2.phys.15.loss_of_dword_sync_count 1 1487457378
oak-io1-s1.SAS9300-8e.0x500605b00ab05678.Switch184.io1-sassw2.phys.15.phy_reset_problem_count 0 1487457378
oak-io1-s1.SAS9300-8e.0x500605b00ab05678.Switch184.io1-sassw2.phys.15.running_disparity_error_count 1 1487457378
...
```

sasutils

- sas_devices
- sas_discover
- sas_counters
- ses_report

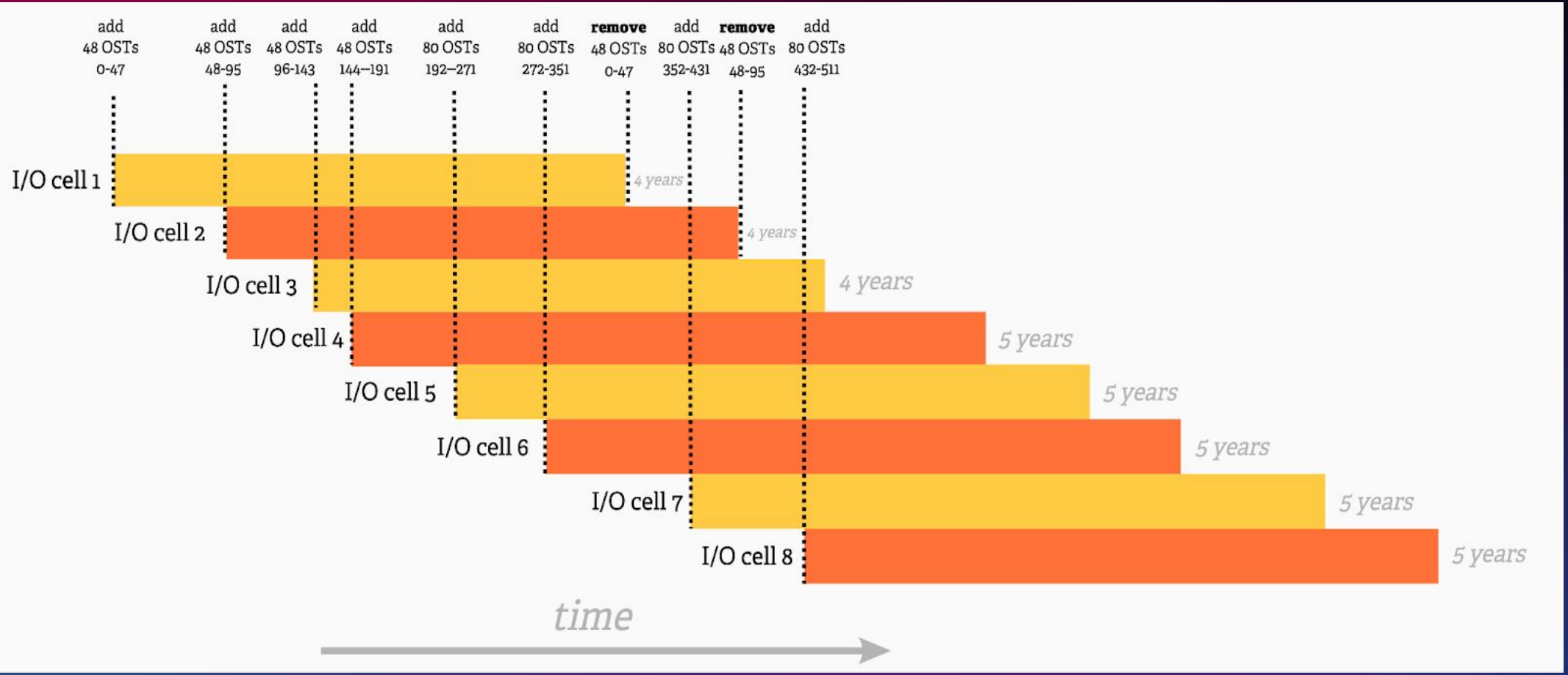
```
$ ses_report --carbon --prefix=datacenter.stanford
datacenter.stanford.io1-sassw1.Cooling.Left_Fan.speed_rpm 19560 1476486766
datacenter.stanford.io1-sassw1.Cooling.Right_Fan.speed_rpm 19080 1476486766
datacenter.stanford.io1-sassw1.Cooling.Center_Fan.speed_rpm 19490 1476486766

# ses_report --status --prefix=datacenter.stanford | grep SIM
datacenter.stanford.io1-jbod1-0.Enclosure_services_controller_electronics.SIM_00 OK
datacenter.stanford.io1-jbod1-0.Enclosure_services_controller_electronics.SIM_01 OK
datacenter.stanford.io1-jbod1-0.SAS_expander.SAS_Expander_SIM_0 OK
datacenter.stanford.io1-jbod1-0.SAS_expander.SAS_Expander_ISIM_2 OK
datacenter.stanford.io1-jbod1-0.SAS_expander.SAS_Expander_ISIM_0 OK
datacenter.stanford.io1-jbod1-1.Enclosure_services_controller_electronics.SIM_00 OK
datacenter.stanford.io1-jbod1-1.Enclosure_services_controller_electronics.SIM_01 OK
datacenter.stanford.io1-jbod1-1.SAS_expander.SAS_Expander_SIM_1 OK
datacenter.stanford.io1-jbod1-1.SAS_expander.SAS_Expander_ISIM_3 OK
datacenter.stanford.io1-jbod1-1.SAS_expander.SAS_Expander_ISIM_1 OK
```

sasutils

- sas_counters
- sas_discover
- sas_devices
- ses_report
- udev scripts
  - sas_sd_snic_alias
  - sas_mpath_snic_alias
- Python library
  - Listing SAS Hosts, Listing Expanders, Listing Unique Expanders, SCSI Enclosure

Oak storage lifecycle overview



lctl del_ost

- Introduced in Lustre 2.16 (to be release mid-2023)
  - Documentation is located :
    - https://build.whamcloud.com/job/lustre-manual/lastSuccessfulBuild/artifact/lustre_manual.xhtml#lustremaint.remove_ost

ibswinfo

- Leverages the MFT (Mellanox Firmware Tools)
  - Normally used for Firmware updates on switches and IB cards
  - Can also probe the hardware and provide status data

ibswinfo

```
# ./ibswinfo.sh -d /dev/mst/<device>
==============================
<node description>
==============================
part number        | MQM8790-HS2F
serial number      | <redacted>
product name       | Jaguar Unmng IB
200
revision           | AC
ports              | 40
PSID               | MT_0000000063
GUID               | <redacted>
firmware version   | 27.2000.1886
----------------------------------------
uptime (d-h:m:s)   | 196d-07:05:40
----------------------------------------
PSU0 status        | OK
    P/N            | MTEF-PSF-AC-C
    S/N            | <redacted>
    DC power       | OK
    fan status     | OK
    power (W)      | 64
PSU1 status        | OK
    P/N            | MTEF-PSF-AC-C
    S/N            | <redacted>
    DC power       | OK
    fan status     | OK
    power (W)      | 47
----------------------------------------
temperature (C)    | 34
max temp (C)       | 41
----------------------------------------
fan status         | OK
fan#1 (rpm)        | 5426
fan#2 (rpm)        | 4746
fan#3 (rpm)        | 5426
fan#4 (rpm)        | 4798
fan#5 (rpm)        | 5426
fan#6 (rpm)        | 4815
fan#7 (rpm)        | 5382
fan#8 (rpm)        | 4868
fan#9 (rpm)        | 5471
----------------------------------------
```

Slurm SPANK GPU Plugin

- Slurm Plug-in Architecture for Node and job (K)control - SPANK
- Written in Lua
- Requires that the slurm-spank-lua plugin is installed
- Flag:
  - --gpu_cmode=[shared | exclusive | prohibited]

Conclusion

sasutils: https://github.com/stanford-rc/sasutils

ibswinfo: https://github.com/stanford-rc/ibswinfo

Slurm SPANK GPU Plugin: https://github.com/stanford-rc/slurm-spank-gpu_cmode