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Utilization and accounting

When you submit jobs, they are using physical resources such as CPUs, Memory, Network, GPUs, Energy etc. We keep track of the usage of some of those resource. On this page we'll let you know how to consult your usage of the resource. We have several tools that you can use to consult your utilization: sacct, sreport, openxdmod

Comparison of sreport, sacct, and sshare

We use **sreport** as our primary accounting reference. However, you may find other tools useful for specific purposes. Here's a comparison:

- **sacct**: Displays only account jobs, excluding time allocated via reservations. If duplicate jobs exist, only one is shown.
- **sreport**: By default, jobs with wall times overlapping the report's time range are truncated. For reservation-based jobs, the requested idle time is distributed among all users with access to the reservation.
- **sshare**: Not recommended for accounting purposes; displayed values are adjusted based on fairshare calculations.

Resource accounting uniformization

We apply uniform resource accounting by converting GPU hours and memory usage into CPU-hour equivalents, using the [TRESBillingWeights](#) feature provided by SLURM. A CPU hour represents one hour of processing time on a single CPU core.

We use this model because our cluster is heterogeneous, and both the computational power and the cost of GPUs vary significantly depending on the model. To ensure fairness and transparency, each GPU type is assigned a weight that reflects its relative performance compared to a CPU core. Similarly, memory usage is converted into CPU-hour equivalents based on predefined weights.

We also bill memory usage because some jobs consume very little CPU but require large amounts of memory, which means an entire compute node is occupied. This ensures that jobs using significant memory resources are accounted for fairly.

Example: A job using a GPU with a weight of 10 for 2 hours and memory equivalent to 5 CPU hours would be billed as 25 CPU hours. This approach guarantees consistent, transparent, and fair resource accounting across all heterogeneous components of the cluster.

You can check the up to date conversion details by inspecting the parameters of any partition on the clusters. The same conversion table is applied everywhere.

```
(bamboo)-[root@slurm1 ~]$ scontrol show partition debug-cpu | grep
TRESBillingWeights | tr "," "\n"
  TRESBillingWeights=CPU=1.0
Mem=0.25G
GRES/gpu=1
GRES/gpu:nvidia_a100-pcie-40gb=5
GRES/gpu:nvidia_a100_80gb_pcie=8
GRES/gpu:nvidia_geforce_rtx_2080_ti=2
GRES/gpu:nvidia_geforce_rtx_3080=3
GRES/gpu:nvidia_geforce_rtx_3090=5
GRES/gpu:nvidia_geforce_rtx_4090=8
GRES/gpu:nvidia_rtx_a5000=5
GRES/gpu:nvidia_rtx_a5500=5
GRES/gpu:nvidia_rtx_a6000=8
GRES/gpu:nvidia_titan_x=1
GRES/gpu:tesla_p100-pcie-12gb=1
```

Here you can see for example that using a gpu nvidia_a100-pcie-40gb for 1 hour is equivalent in term of cost to use 5 CPUhour.

Resources available for research group

Research groups that have invested in the HPC cluster by purchasing private CPU or GPU nodes benefit from **high-priority access** to these resources.

Although these nodes remain available to all users, owners receive **priority scheduling** and a predefined annual allocation of compute hours, referred to as **billings**. The advantage of this approach is flexibility: you are free to use any resource on any cluster, rather than being restricted to your own nodes. When doing so, your billings will be consumed.

To view details of owned resources, users can run the script:
`ug_getNodeCharacteristicsSummary.py` This script provides a summary of the node characteristics within the cluster.

Note: This model ensures **fairness** across all users. Even if some groups own nodes, resources remain shared. Usage beyond the included billings will be **charged according to the standard accounting model**, ensuring equitable access for everyone.

Output example of the script:

```

ug_getNodeCharacteristicsSummary.py --partitions private-<group>-gpu
private-<group>-cpu --cluster <cluster> --summary
host      sn          cpu      mem      gpunumber      gpudeleted      gpumodel
gpumemory purchasedate      months remaining in prod. (Jan 2025)      billing
-----
-----
-----
cpu084  N-20.02.151      36      187      0      0
0  2020-02-01      1      79
[...]
cpu088  N-20.02.155      36      187      0      0
0  2020-02-01      1      79
[...]
cpu226  N-19.01.161      20      94      0      0
0  2019-01-01      0      41
[...]
cpu229  N-19.01.164      20      94      0      0
0  2019-01-01      0      41
cpu277  N-20.11.131      128      503      0      0
0  2020-11-01      10      251
gpu002  S-16.12.215      12      251      5      0  NVIDIA TITAN X
(Pascal)      12288  2016-12-01
0      84
gpu012  S-16.12.216      24      251      8      0  NVIDIA GeForce
RTX 2080 Ti      11264  2016-12-01
0      108
gpu017  S-20.11.146      128      503      8      0  NVIDIA GeForce
RTX 3090      24576  2020-11-01
10      299
gpu023  S-21.09.121      128      503      8      0  NVIDIA GeForce
RTX 3080      10240  2021-09-01
20      283
gpu024  S-21.09.122      128      503      8      0  NVIDIA GeForce
RTX 3080      10240  2021-09-01
20      283
gpu044  S-23.01.148      128      503      8      0  NVIDIA RTX
A5000      24564  2023-01-01
36      299
gpu047  S-23.12.113      128      503      8      0  NVIDIA RTX
A5000      24564  2023-12-01
47      299
gpu049  S-24.10.140      128      384      8      0  NVIDIA GeForce
RTX 4090      24564  2024-10-01
57      291

===== Summary
=====
Total CPUs: 1364 Total CPUs memory[GB]: 6059 Total GPUs: 61 Total GPUs
memory[MB]: 142300 Billing: 1959 CPUhours per year: 10.30M

```

How to read the output:

- **host**: the hostname of the compute node
- **sn**: the serial number of the node
- **cpu**: the number of CPUs available in the node
- **mem**: the quantity of memory on the node in GB
- **gpunumber**: the number of GPU cards on the node
- **gpudeleted**: the number of GPU cards out of order
- **gpumodel**: the GPU model
- **gpumemory**: the GPU memory in MB per GPU card
- **purchasedate**: the purchase date of the node
- **months remaining in prod. (Jan 2025)**: the number of months the node remains the property of the research group, the reference date is indicated in parenthesis. In this example it is January 2025.
- **billing**: the [billing](#) value of the compute node

You can modify the reference year if you want to “simulate” the hardware you'll have in your private partition in a given year. To do so, use the argument `--reference-year` of the script.

Job accounting

OpenXDMoD

We track the job usage of our clusters here: <https://openxdmod.hpc.unige.ch/>

We have a tutorial explaining some of the features: [here](#)

Openxdmod is integrated into our SI. When you connect to it, you'll get the profile “user” and the data are filtered by your user by default. If you are a PI, you can ask us to change your profile to be PI.



OpenXDMoD currently supports only CPUh and GPUh metrics, not the [billing](#) metrics (yet?). For this reason, you need to use [sreport](#) or [our script](#) if you want to view the billed metrics.

sacct

You can see your job history using `sacct`:

```
[sagon@master ~] $ sacct -u $USER -S 2021-04-01
```

JobID	JobName	Partition	Account	AllocCPUS	State	ExitCode
45517641	jobname	debug-cpu	rossigno	1	FAILED	2:0
45517641.ba+	batch		rossigno	1	FAILED	2:0
45517641.ex+	extern		rossigno	1	COMPLETED	0:0
45517641.0	R		rossigno	1	FAILED	2:0
45518119	jobname	debug-cpu	rossigno	1	COMPLETED	0:0
45518119.ba+	batch		rossigno	1	COMPLETED	0:0

45518119.ex+	extern	rossigno	1	COMPLETED	0:0
--------------	--------	----------	---	-----------	-----

Report and statistics with sreport

To get reporting about your past jobs, you can use sreport (<https://slurm.schedmd.com/sreport.html>).

We wrote a helper that you can use to get your past resource usage on the cluster. This script can display the resource utilization

- for each user of a given account (PI)
- total usage of a given account (PI)

```
(baobab)-[sagon@login1] $ ug_slurm_usage_per_user.py --help
usage: ug_slurm_usage_per_user.py [-h] [--user USER] [--start START] [--end
END] [--pi PI] [--group GROUP] [--cluster {baobab,yggdrasil,bamboo}] [--all-
users] [--aggregate] [--report-type {user,account}]
                                [--time-format {Hours,Minutes,Seconds}] [-
-verbose]
```

Retrieve HPC utilization statistics for a user or group of users.

options:

```
-h, --help          show this help message and exit
--user USER        Username to retrieve usage for.
--start START       Start date (default: first of month).
--end END           End date (default: now).
--pi PI            Specify a PI manually.
--group GROUP       Specify a group name to get all PIs belonging to it.
--cluster {baobab,yggdrasil,bamboo}
                    Cluster name (default: all clusters).
--all-users         Include all users under the PI account.
--aggregate         Aggregate the usage per user.
--report-type {user,account}
                    Type of report: user (default) or account.
--time-format {Hours,Minutes,Seconds}
                    Time format: Hours (default), Minutes, or Seconds.
--verbose           Verbose output.
```

By default when you run this script, it will print your past usage of the current month, for all the accounts you are member of.

Usage details of a given PI

```
(baobab)-[sagon@login1] $ ug_slurm_usage_per_user.py --pi **** --report-type
account --start 2025-01-01
-----
----
```

Cluster/Account/User Utilization 2025-01-01T00:00:00 - 2025-12-08T13:59:59
(29512800 secs)

Usage reported in TRES Hours

Cluster	Login	Proper Name	Account	TRES Name	Used
-----	-----	-----	-----	-----	-----
bamboo			krusek	billing	176681
baobab			krusek	billing	961209
yggdrasil			krusek	billing	0
Total usage: 1.14M					

Usage details of all PIs associated with a private group

Usage example to see the resource usage from the beginning of 2025 for all the PIs and associate users of the group private_xxx. The group private_xxx owns several compute nodes:

(baobab)-[sagon@login1 ~]\$ ug_slurm_usage_per_user.py --group private_xxx --start=2025-01-01 --report-type=account

Cluster/Account/User Utilization 2025-01-01T00:00:00 - 2025-08-21T14:59:59
(20095200 secs)

Usage reported in TRES Hours

Cluster	Login	Proper Name	Account	TRES Name	Used
-----	-----	-----	-----	-----	-----
baobab			PI1	billing	56134
yggdrasil			PI1	billing	105817
bamboo			PI2	billing	5416
baobab			PI2	billing	1517001
yggdrasil			PI2	billing	23775
bamboo			PI3	billing	0
baobab			PI3	billing	1687963
yggdrasil			PI3	billing	1344599
[...]					
Total usage: 7.36M					

Aggregate usage by all users of a given PI

```
$ ug_slurm_usage_per_user.py --pi ***** --report-type account --start
2025-01-01 --all-users --aggregate
```

```
-----
----
Cluster/Account/User Utilization 2025-01-01T00:00:00 - 2025-12-08T13:59:59
(29512800 secs)
```

```
Usage reported in TRES Hours
```

```
-----
----
Login      Used
-----
a***u      547746
d***i      272634
d***on      91178
d***l      86860
e***j      60649
v***d0      37962
w***r      29886
s***o       9120
k***k       1853
m***l         1
Total usage: 1.14M
```

sreport examples

Here are some examples that can give you a starting point :

To get the number of jobs you ran (you ⇔ \$USER) in 2018 (dates in yyyy-mm-dd format) :

```
[brero@login2 ~]$ sreport job sizesbyaccount user=$USER PrintJobCount
start=2018-01-01 end=2019-01-01
```

```
-----
----
Job Sizes 2018-01-01T00:00:00 - 2018-12-31T23:59:59 (31536000 secs)
Units are in number of jobs ran
```

```
-----
----
Cluster  Account    0-49 CPUs   50-249 CPUs  250-499 CPUs  500-999 CPUs
>= 1000 CPUs % of cluster
-----
-----
baobab    root           180           40           4           15
0         100.00%
```

You can see how many jobs were run (grouped by allocated CPU). You can also see we specified an extra day for the *end date* `end=2019-01-01` in order to cover the whole year :

```
Job Sizes 2018-01-01T00:00:00 - 2018-12-31T23:59:59 ' '
```

You can also check how much CPU time (seconds) you have used on the cluster between since 2019-09-01 :

```
[brero@login2 ~]$ sreport cluster AccountUtilizationByUser user=$USER
start=2019-09-01 -t Seconds
-----
----
Cluster/Account/User Utilization 2019-09-01T00:00:00 - 2019-09-09T23:59:59
(64800 secs)
Usage reported in CPU Seconds
-----
----
Cluster      Account      Login      Proper Name      Used      Energy
-----
baobab       rossigno     brero      BRERO Massimo    1159      0
```

In this example, we added the time `-t Seconds` parameter to have the output in seconds. *Minutes* or *Hours* are also possible.

Please note :

- By default, the CPU time is in Minutes
- It takes up to an hour for Slurm to update this information in its database, so be patient
- If you don't specify a start, nor an end date, yesterday's date will be used.
- The CPU time is the time that was allocated to you. It doesn't matter if the CPU was actually used or not. So let's say you ask for 15min allocation, then do nothing for 3 minutes then run 1 CPU at 100% for 4 minutes and exit the allocation, then 7 minutes will be added to your CPU time.

Tip : If you absolutely need a report including your job that ran on the same day, you can override the default end date by forcing tomorrow's date :

```
sreport cluster AccountUtilizationByUser user=$USER start=2019-09-01
end=$(date --date="tomorrow" +%Y-%m-%d) -t seconds
```

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