Uni.lu HPC School 2018

PS2: HPC workflow with sequential jobs

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http://hpc.uni.lu

Latest versions available on Github:

UL HPC tutorials:	https://github.com/ULHPC/tutorials
UL HPC School:	http://hpc.uni.lu/hpc-school/
PS2 tutorial sources:	

Summary

Main Objectives of this Session

- Run **sequential**, **parametric programs** on the clusters
- Learn how-to use our set of launcher scripts
- Submit jobs
- use the cluster monitoring tools
  - ↪ Slurm-web

Tutorial Notes:

https://github.com/ULHPC/tutorials/tree/devel/basic/getting_started

http://git.io/5cYmPw

Summary

Getting started

```
# Connect to the cluster(s)
(laptop)$> ssh {iris,gaia,chaos}-cluster

#  Send files
(laptop)$> rsync -avz local_directory {iris,gaia,chaos}-cluster:

# Retrieve files
(laptop)$> rsync -avz {iris,gaia,chaos}-cluster:path/to/files local_dir
```

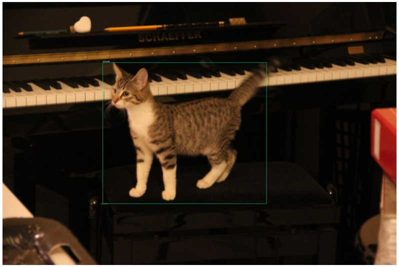
- **Submit jobs**

OAR on Chaos/Gaia	**Slurm** on Iris
`oarsub -I`	`srun -p interactive [--qos qos-interactive] --pty bash`
`oarsub ./program`	`sbatch program`

Summary

Object Detection

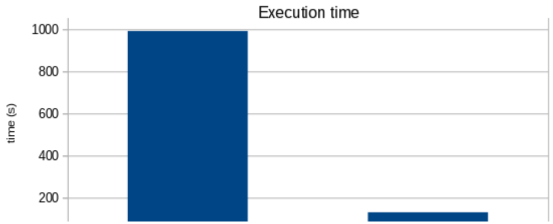
ImageAI: Simple Python library based on Tensorflow for image prediction, custom image prediction, object detection, video detection, video object tracking and image predictions trainings.
Tensorflow: Open Source Machine Learning Framework



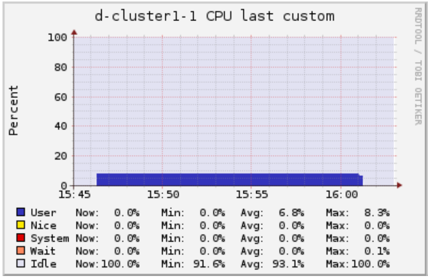
Comparison

2 approaches

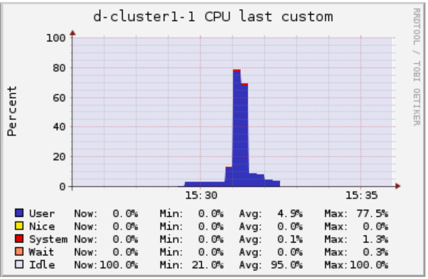
- Sequential (loop)
- Parallized (with GNU parallel)



Comparison - Ganglia



```
■ User    Now:  0.0%   Min:  0.0%   Avg:  6.8%   Max:  8.3%
■ Nice    Now:  0.0%   Min:  0.0%   Avg:  0.0%   Max:  0.0%
■ System  Now:  0.0%   Min:  0.0%   Avg:  0.0%   Max:  0.0%
■ Wait    Now:  0.0%   Min:  0.0%   Avg:  0.0%   Max:  0.1%
□ Idle    Now:100.0%   Min: 91.6%   Avg: 93.1%   Max:100.0%
```



```
■ User    Now:  0.0%   Min:  0.0%   Avg:  4.9%   Max: 77.5%
■ Nice    Now:  0.0%   Min:  0.0%   Avg:  0.0%   Max:  0.0%
■ System  Now:  0.0%   Min:  0.0%   Avg:  0.1%   Max:  1.3%
■ Wait    Now:  0.0%   Min:  0.0%   Avg:  0.0%   Max:  0.3%
□ Idle    Now:100.0%   Min: 21.0%   Avg: 95.0%   Max:100.0%
```

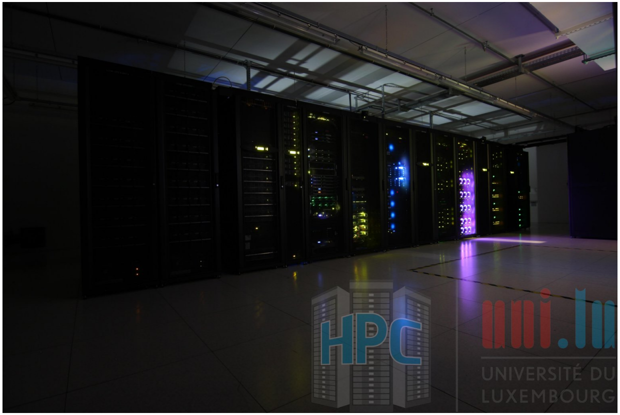
Summary

Watermark Application

- **Objective**: Apply a watermark to a given set of pictures
  - ↪ Simple Python script
  - ↪ Generic parallel launcher
  - ↪ Distribute the work on several nodes

Source image

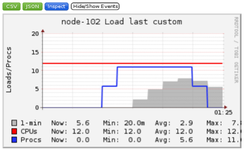
Watermarked image



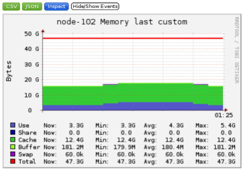
Summary

Jcell & cGAs

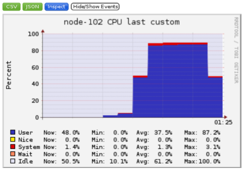
- **JCell**: a Java framework for working with genetic algorithms
  - ↪ Ex: Generational algorithm for the Combinatorial ECC problem
- Test the variations of these parameters:
  - ↪ *Mutation probability* and *Crossover probability*



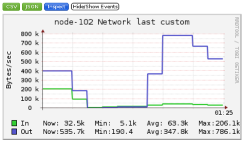
▨ 1-min	Now: 5.6	Min: 20.0m	Avg: 2.9	Max: 7.
🟥 CPUs	Now: 12.0	Min: 12.0	Avg: 12.0	Max: 12.
🟦 Procs	Now: 0.0	Min: 0.0	Avg: 5.6	Max: 11.



🟦 Use	Now: 3.3G	Min: 3.3G	Avg: 4.3G	Max: 5.4G
🟦 Share	Now: 0.0	Min: 0.0	Avg: 0.0	Max: 0.0
🟩 Cache	Now: 12.4G	Min: 12.4G	Avg: 12.4G	Max: 12.4G
🟩 Buffer	Now: 181.2M	Min: 179.9M	Avg: 180.4M	Max: 181.2M
🟪 Swap	Now: 60.0k	Min: 60.0k	Avg: 60.0k	Max: 60.0k
🟥 Total	Now: 47.3G	Min: 47.3G	Avg: 47.3G	Max: 47.3G



🟦 User	Now: 48.0%	Min: 0.0%	Avg: 37.5%	Max: 87.2%
🟨 Nice	Now: 0.0%	Min: 0.0%	Avg: 0.0%	Max: 0.0%
🟥 System	Now: 1.4%	Min: 0.0%	Avg: 1.3%	Max: 3.1%
🟧 Wait	Now: 0.0%	Min: 0.0%	Avg: 0.0%	Max: 0.0%
⬜ Idle	Now: 50.5%	Min: 10.1%	Avg: 61.2%	Max: 100.0%



🟩 In	Now: 32.5k	Min: 5.1k	Avg: 63.3k	Max: 206.1k
🟦 Out	Now: 535.7k	Min: 190.4	Avg: 347.8k	Max: 786.1k

Summary

Conclusion

- We have covered one of the most common workflow:
  $\hookrightarrow$ **parametric jobs**
- Our launchers can be improved!

Perspectives

- Array jobs
- Best effort jobs
- Checkpoint/Restart mechanism

Thank you for your attention...

Questions?

http://hpc.uni.lu

High Performance Computing @ uni.lu

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