"My name is HAL. I became operational on March 25 2019 at the Innovative Systems Lab in Urbana, Illinois. My creators are putting me to the fullest possible use, which is all I think that any conscious entity can ever hope to do." (paraphrased from https://en.wikipedia.org/wiki/HAL_9000)

In publications and presentations that use results obtained on this system, please include the following acknowledgement: “This work utilizes resources supported by the National Science Foundation’s Major Research Instrumentation program, grant #1725729, as well as the University of Illinois at Urbana-Champaign”.


Hardware-Accelerated Learning (HAL) cluster

Effective May 19, 2020, two-factor authentication via NCSA Duo is now required for SSH logins on HAL. See https://go.ncsa.illinois.edu/2fa for instructions to sign up.

Contact us

Request access to this system: Application
Contact ISL staff: Email Address
Visit: NCSA, room 3050E
### Host name:
hal.ncsa.illinois.edu

### Hardware
- 16 IBM AC922 nodes
  - IBM 8335-GTH
  - AC922 server
    - 2x 20-core IBM POWER9 CPU @ 2.4 GHz
    - 256 GB DDR4
    - 4x NVIDIA V100 GPUs
    - 5120 cores
    - 16 GB HBM 2
    - 2-Port EDR 100 Gb/s IB ConnectX-5 Adapter
- 1 IBM 9006-22P storage node
  - 72TB Hardware RAID array
  - NFS
- 2 DDN GS400NVE Flash Arrays
  - 244 TB usable, NVME SSD-based storage
  - Spectrum Scale File System

### Software
- CentOS 7.7
- CUDA 10.2.89
  - cuDNN 7.6.5
  - NCCL 2.5.6
- IBM XL C and IBM XL FORTRAN 16.1.1
- Advance toolchain for Linux on Power 12.0
- PGI Community Edition 19.4
- PowerAI 1.7.0
- SLURM 20.02.0

### Documentation
- Job management with SLURM
- Modules management
- Getting started with WMLCE (former PowerAI)
- Working with containers
- Installing python packages
- Getting started with HAL OnDemand
- Profiling GPU Programs
- Data Movement In/Out of HAL

### Science on HAL

### Software for HAL

To request access: fill out this form. Make sure to follow the link in the confirmation email to request actual system account.

### Frequently Asked Questions

To report problems: email us

For our new users: New User Guide for HAL System

User group Slack space: https://join.slack.com/t/halillinoisncsa

Real-time system status: https://hal-monitor.ncsa.illinois.edu:3000/

HAL OnDemand portal: https://hal-ondemand.ncsa.illinois.edu/

Globus Endpoint: ncsahal

Quick start guide: (for complete details see Documentation section on the left)

To connect to the cluster:

```
ssh <username>@hal.ncsa.illinois.edu
```

To submit interactive job:

```
srun -p gpux1
```

To submit a batch job:

```
sbatch run_script.swb
```

Job Queue time limits:
- "debug" queue: 4 hours
- "gpux<n>" and "cpun<n>" queues: 24 hours

To load IBM Watson Machine Learning Community Edition (former IBM PowerAI) module:

```
module load wmlce
```

To see CLI scheduler status:

```
swqueue
```