"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
- **3 DDN GS400NVE Flash Arrays**
  - 360 TB usable, NVME SSD-based storage
  - Spectrum Scale File System

### Software
- **RedHat 8.4**
- **CUDA 11.2.2**
  - cuDNN 8.1.1
  - NCCL 2.8.3
- **Nvidia HPC-SDK 21.5**
- **PowerAI 1.7.0**
- **OpenCE 1.3.1**
- **SLURM 20.02.3**

### Documentation
- **Job Management with SLURM**
- **Module Management with LMod**
- **Getting started with HAL OnDemand**
- **Getting started with OpenCE (former WMLCE)**
- **Getting started with WMLCE (former PowerAI)**
- **How to Customize Python Environment on HAL**
- **Working with Containers**
- **Profiling GPU Programs**
- **Data Movement In/Out of HAL**
- **Distributed Training on HAL System**

### 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/hallinoisncsa

Real-time Dashboards: Here

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:

```
swrun -p gpux1
```

To submit a batch job:

```
swbatch run_script.swb
```

**Job Queue time limits:**

- "debug" queue: 4 hours
- "gpux-n" and "cpun-n" queues: 24 hours

**Resource limits:**

- 5 concurrently running jobs
- concurrently allocated resources
  - 5 nodes
  - 16 GPUs
- For larger/more numerous jobs, please contact admins for a special arrangement and/or a reservation

To load the OpenCE module (provides PyTorch, Tensorflow and other ML tools):

```
module load opence
```

To see CLI scheduler status:

```
swqueue
```