

# HAL cluster

"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](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".

**Also, please include the following reference in your publications:** "V. Kindratenko, D. Mu, Y. Zhan, J. Maloney, S. Hashemi, B. Rabe, K. Xu, R. Campbell, J. Peng, and W. Gropp. HAL: Computer System for Scalable Deep Learning. In *Practice and Experience in Advanced Research Computing (PEARC '20)*, July 26–30, 2020, Portland, OR, USA. ACM, New York, NY, USA, 15 pages. <https://doi.org/10.1145/3311790.3396649>".

## Hardware-Accelerated Learning (HAL) cluster

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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/halillinoisncsa>

**Real-time Dashboards:** [Here](#)

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

**Globus Endpoint:** [ncsa#hal](#)

**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
```