Chicago Fusion Team Members

- Students:
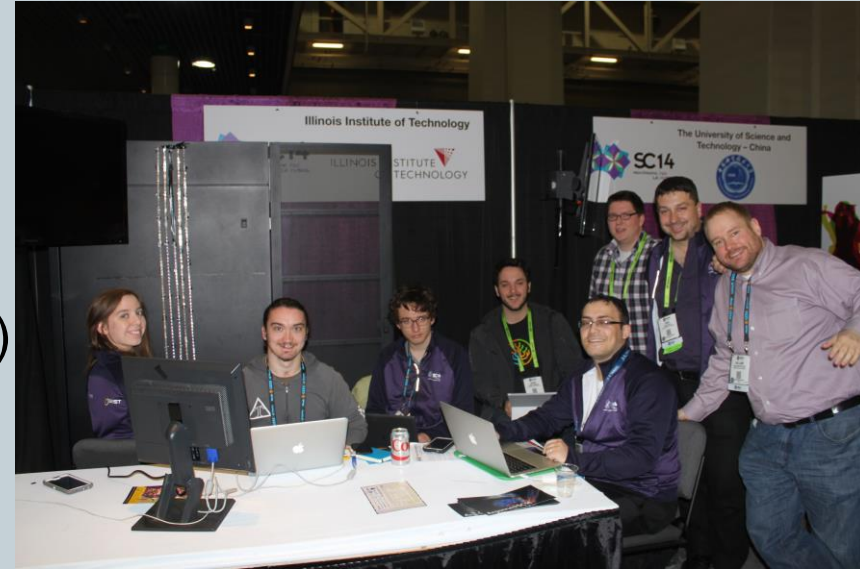 - Alex Ballmer (1st year UG)
  - Ben Walters (2nd year UG)
  - Dan Gordon (4th year UG)
  - Jason DiBabbo (4th year UG)
  - Kevin Brandstatter (4th year UG)
  - Lauren Ribordy (Highschool)
- Advisor:
  - Ioan Raicu (IIT/Argonne)
- Others:
  - **William Scullin (Argonne), Ben Allen (Argonne)**, Cosmin Lungu (1st year UG) Andrei Dumitru (1st year UG), Adnan Haider (1st year UG), Dongfang Zhao (4th year PhD), Tonglin Li (6th year PhD), Ke Wang (5th year PhD), Scott Krieder (4th year PhD)

L&A

Hardware, Software, and Sponsors

- 6 node cluster with IB 56Gb/s * 2 (36-port IB switch)
- 2x Intel Xeon E5-2699 v3 (Haswell) 18-core CPUs @ 2.3 GHz (on dual socket Supermicro system)
- 10 Nvidia K40 GPUs (2 per node on 5 nodes)
- 128 GB RAM per node
- ~3TB of SSD storage
- Software: CentOS 7, Slurm, Warewulf, GPFS, MVAPICH2, Intel MPI, CUDA
- Sponsors:
  - **Intel, Mellanox, NVIDIA, and Argonne National Lab.**

B

What We've Learned

- Automating processes will save your life
- Stateless provisioning is priceless
- The wonders of resource management (Slurm is still tempermental)
- How to (not) break electrical circuits and how to solder circuits
- Older hardware (e.g. SSD drives) are not worthwhile due to issues in reliability
- The error-prone process of managing a computing cluster
- How to tune the OS, storage, network, and HPC apps

D

Our Biggest Challenge

- Change in complete architecture and software 5 weeks before
  - Chasis ➔ challenged us in low level support for power management
  - CPUs ➔ Ivy bridge to Haswell
  - GPUs ➔ K20 to K40
  - Network ➔ 40Gb/sec Ethernet to 56Gb/sec Infiniband
  - OS ➔ CentOS to Warewolf
  - MPI ➔ OpenMPI to MVAPICH2
- Hardware arrived unassembled 10 days before we shipped (overnight)
- Allowed team only a few days to debug the new environment and tune the code
- Change in complete architecture and software 5 weeks before
  - Chasis ➔ challenged us in low level support for power management

K

Thanks!

- A big thanks to the SC14 and its organizers
- Our steadfast advisor Ioan Raicu
- Our tireless helper from Argonne (William Scullin, Ben Allen)
- And Wanda (Argonne) who made it possible for us to ship a 1500 lb crate overnight
- Without them, our cluster would never have reached the epic proportions of awesomeness it has

J