Overview of SciNet and Computational Resources in Canada

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SciNet
ADVANCED RESEARCH COMPUTING at the UNIVERSITY OF TORONTO

What is SciNet?

- The SciNet High Performance Computing Consortium is the supercomputing centre at the University of Toronto in Canada.
- We run massively parallel computers to meet the needs of academic researchers across Canada.
- We also do a lot of training.

https://www.scinethpc.ca
https://scinet.courses

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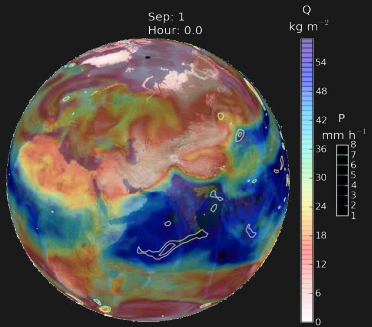
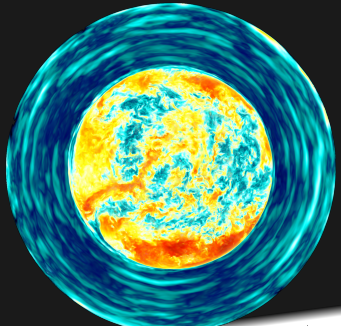
SciNet History

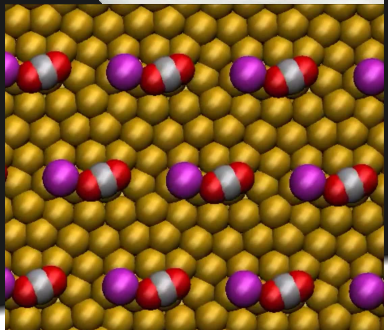
- 2004: Formally started as a consortium of University of Toronto researchers (physics, chemistry, engineering, astronomy,...) and the associated research hospitals in Toronto.
- 2008: First supercomputer in operation. TCS: 3,300 cores / 49 TF
- 2009: Second supercomputer in operation. GPC: 30,240 cores / 169 TF
- 2012: Network upgrade of GPC. GPC: 30,240 cores / 262 TF
- 2012: Hosting a third supercomputer (owned by SOSCIP). BGQ: 32,768 cores / 358 TF
- 2014: Expansion of BGQ (owned by SOSCIP & LKSAVI). BGQ: 65,536 cores / 716 TF
- 2018: New supercomputer (TCS and GPC retired). Niagara: 61,920 cores / 3,074 TF
  Number 53 on Top500, number 28 on Green500.
- 2019: BGQ retired, Niagara still on number 69 on Top500, number 31 on Green500.

Research Topics

- Astronomy
- Astrophysics
- Material Science
- Particle Physics
- Chemical Physics
- Computational Chemistry
- Bioinformatics
- Medical Science
- Biochemistry
- Forestry
- Climate Science, ...



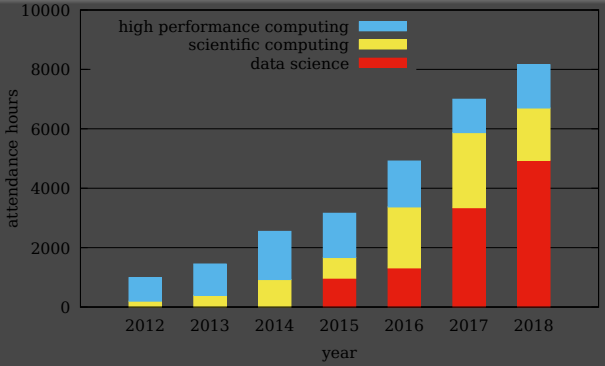




SciNet Training and Education

Training Evolution

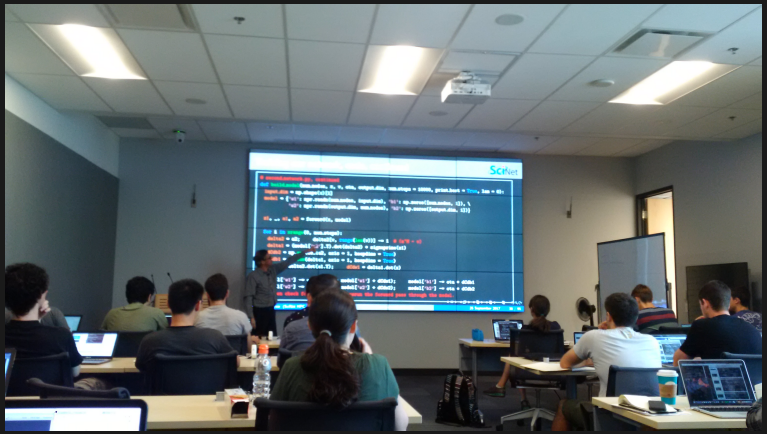
- Well-trained users can make more use out of oversubscribed resources.
- SciNet has been training and educating users from the start.
- Sponsoring of the IHPCSS is part of that.
- But there is also a lot of local demand for training, which we try to accomodate.



- Demand for training, especially in data science, is on the rise.

Training Topics

- Parallel Programming (MPI, OpenMP, CUDA)
- Scientific Computing
- Data Science
- Machine learning
- Computational statistics
- Python, R, C++
- I/O
- Software Engineering
- Visualization



Three semester-long graduate courses have spun off of our training efforts,

one in Physics, one in Medical Science, and one in Biology.

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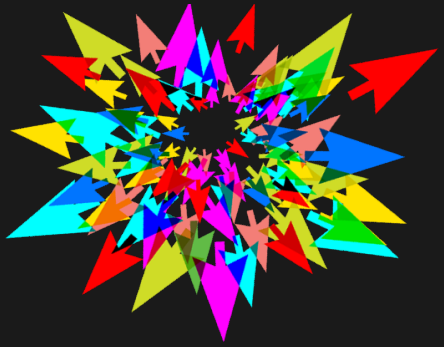
SciNet within the Canadian Landscape

- There are 5 similar consortia in Canada that provide Advanced Research Computing (ARC) and High Performance Computing (HPC) resources to Canadian academic researchers and their collaborators.

  ACENET, Calcul Quebec, WestGrid, SHARCNET, CAC.

- The **Compute Canada Federation** is the not-for-profit organization formed to coordiate their efforts and streamline funding.



- Compute Canada's 35 institutions own the infrastructure and employ the sysadmins and analysts that run and support the facilities.
- Provide resources and support for advanced research computing for **all** Canadian academic researchers.

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Current ARC and HPC Systems

Cedar (2017/2018)
- General Purpose Cluster
- 58,416 CPU cores
- 584 GPU devices

Graham (2017)
- General Purpose Cluster
- 33,448 CPU cores
- 320 GPU devices

Béluga (2019)
- General Purpose Cluster
- 34,880 CPU cores
- 688 GPU devices

Arbutus (2016)
- Cloud system
- 7640 cores

Niagara (2018)
- For large parallel code.
- 61,920 CPU cores
- Specialized high-speed interconnect

How to Get Access

www.computecanada.ca/research-portal/account-management/apply-for-an-account

- Any Canadian academic reserarcher can request a Compute Canada account, and then request an account with the local consortia.
  Researchers can sponsor their group members, as well as (international) collaborators.
- There is no cost to the researchers.
- An account gets you *rapid access status*, so you can run at modest scale and low priority.
- PI can submit to the annual Resource Allocation Competition to request compute (or project) resources; when granted, this translates in priority in the queue and increased limits on number of cores, storage etc.
- support@computecanada.ca or support@scinet.utoronto.ca

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