Overview of SciNet and Computational Resources in Canada

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SciNet HPC Consortium

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What is SciNet?

- The SciNet High Performance Computing Consortium is the supercomputing centre at the University of Toronto.
- 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://support.scinet.utoronto.ca/education`

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SciNet History and Resources

- 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: 60,000 cores / 3,074 TF
  Number 53 on Top500, number 28 on Green500.

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Niagara

https://www.scinethpc.ca/launch-of-niagara/

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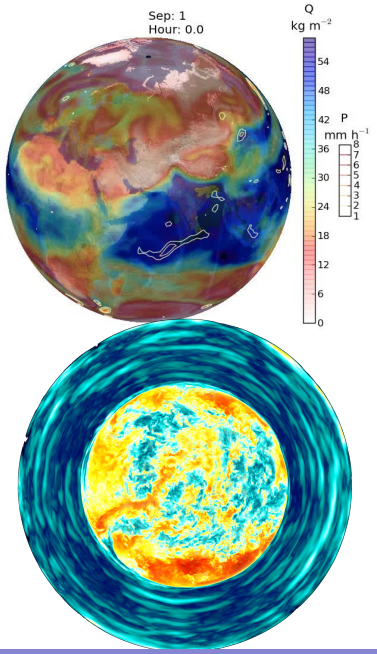
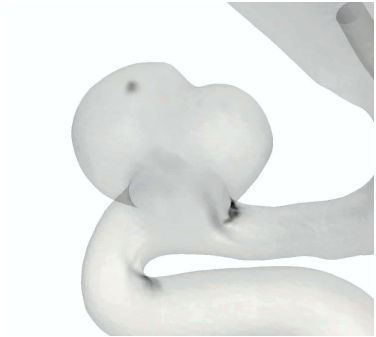
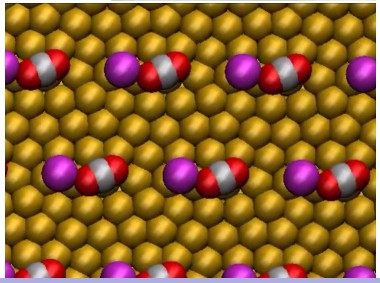
Research Topics

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

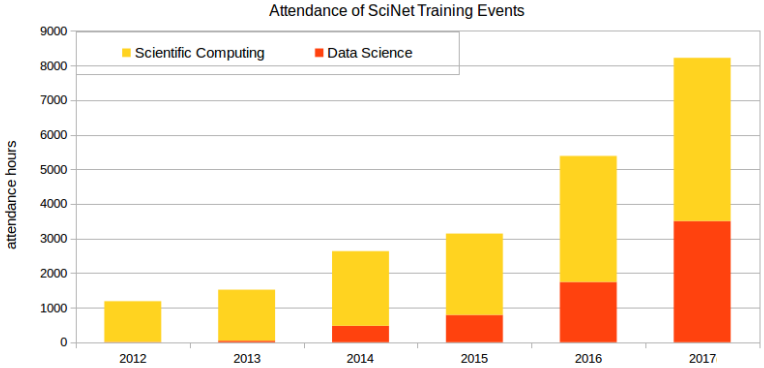






SciNet Training and Education

- 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.

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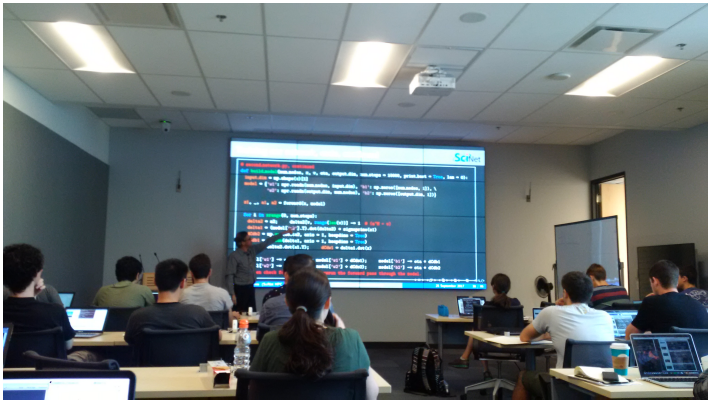
Training Topics

- 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.

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- 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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Many New Systems in Canada

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

GP4 (2019)

- General Purpose Cluster
- 34,400 CPU cores
- 688 GPU devices

Arbutus (2016)

- Cloud system
- 7640 cores

Niagara (2018)

- For large parallel code.
- 60,000 CPU cores
- Specialized high-speed interconnect

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How to Get an 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 involved.
- Always access to support staff.
- Having an account gets you *rapid access status*, i.e., you can run at modest scale and at 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 AT computecanada DOT ca or
  support AT scinet DOT utoronto DOT ca

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