To Compete You Must Compute

Presentation to

Society of High Performance Computing Professionals

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Susan Baldwin
Executive Director
Compute Canada
susan.baldwin@computecanada.org

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Vision

To advance research, support and accelerate innovation and excellence, develop highly qualified personnel, and enable competitive advantage, economic prosperity and well-being for all Canadians through the effective use of high performance computing

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Mission

To create a world-class sustained national platform of shared high performance computing and data resources and personnel, accessible by researchers in all disciplines independent of resource or researcher location and to promote high performance computing nationally and internationally

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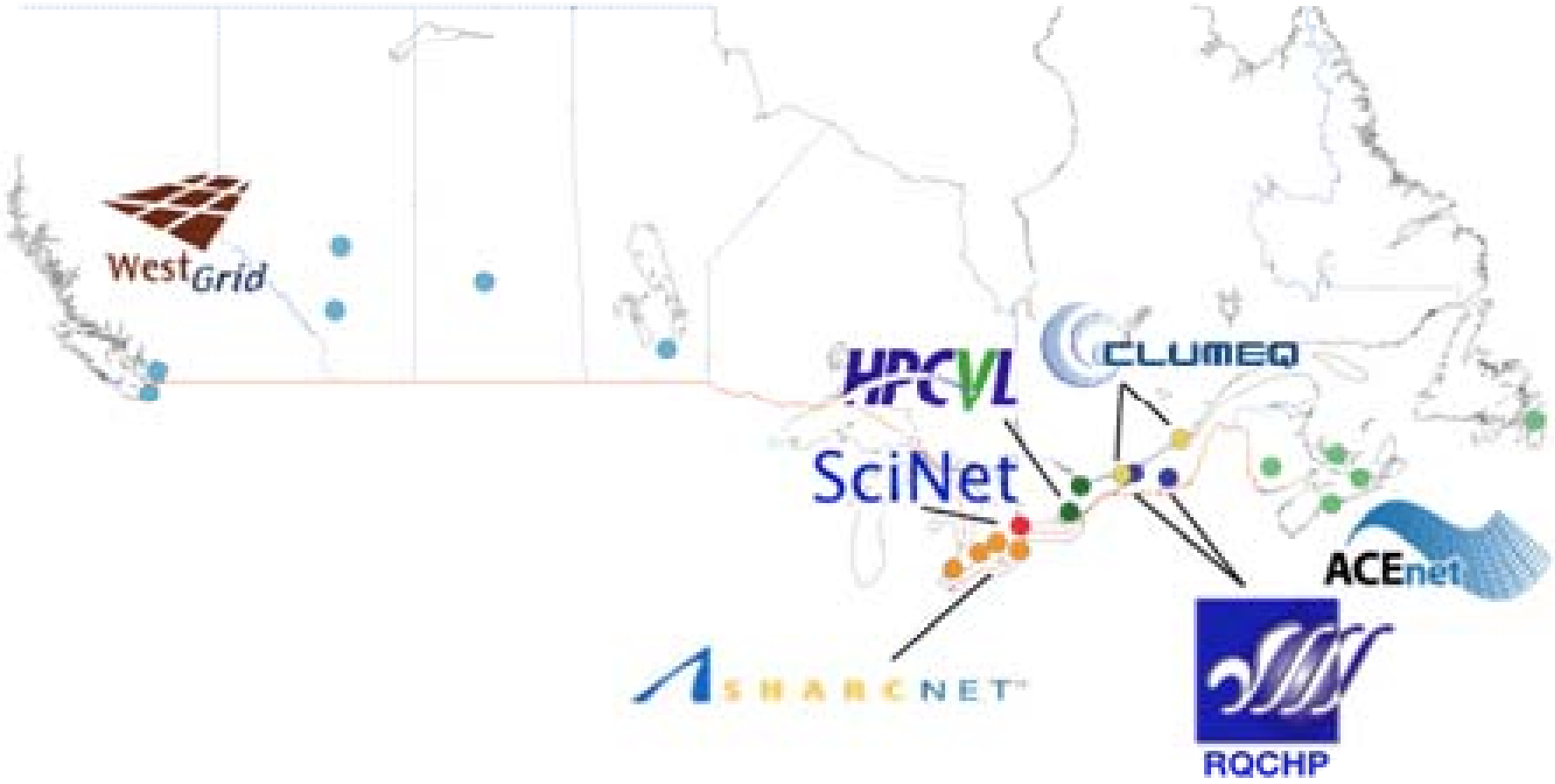
The seven regional consortia



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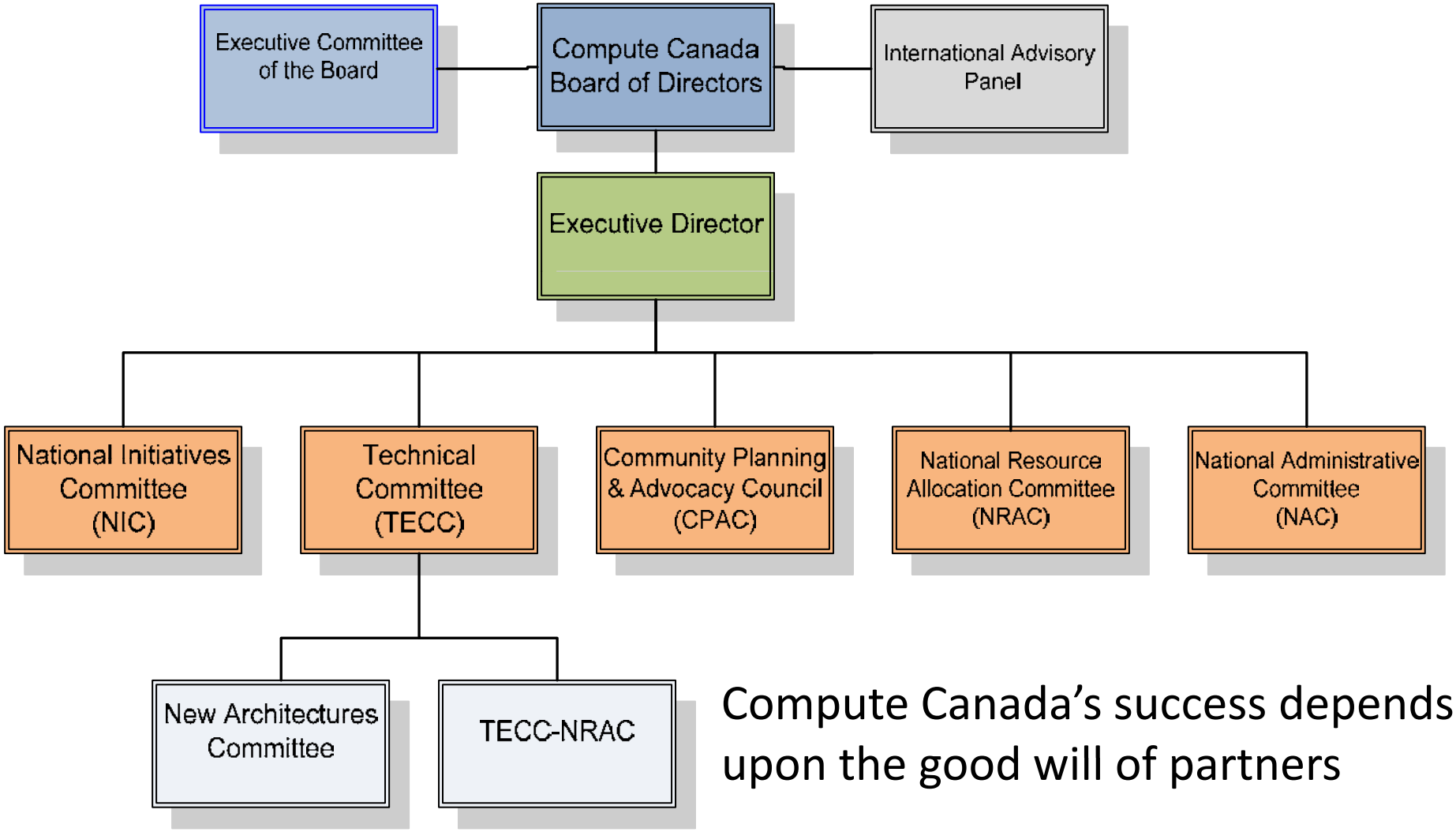
Organization Chart



Compute Canada's success depends upon the good will of partners

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Enabling Canadian Research

Focus is on ensuring the ability of the Canadian researcher to do better research by:

- Using the right facility (wherever in the country)
- Using the right methods
- Using the right amount of compute cycles
- Having the HQP support they need
- Knowing HPC capacity will grow in lock step with their research

This requires predictability and sustainability

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HPC = Supercomputing

"In my opinion, the largest supercomputers at any time, including the first exaflops, should not be thought of as computers. They are strategic scientific instruments that happen to be built from computer technology. Their usage patterns and scientific impact are closer to major research facilities such as Cern, Iter, or Hubble." *(Andrew Jones. Vice President, HPC Business, NAG Ltd.)*

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Cyberinfrastructure: Where We Fit

- HPC is one of the components of digital infrastructure – essential to creating new knowledge
- Digital infrastructure includes:
  - Repositories of complex data sets
  - Network-accessible research equipment
  - Digital devices and distributed sensors
  - High-speed networks
  - Related tools and services
  - Rapidly increasing computing capacity

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Enabling Collaboration

Enabling national and global collaboration to address "grand challenges", productivity challenges and innovation

Climate Change Ocean Science Health Sciences

Transportation Systems Oil and Gas Energy

Disaster Response Space Science

Green IT/HPC High Energy Physics

MANY More…….

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Mid-Term Review

- The International Review Panel that Compute Canada build on its current achievements and ensure the long-term success by developing a strategic plan that strengthens its national role in the Canadian research landscape, including:
  - The value propositions for organizations to participate in and contribute to Compute Canada.
  - A performance assessment framework and arrangements with the consortia that would allow the Board of Compute Canada to regularly review the performance of Compute Canada in delivering on its plan.
- A formal executive process to allow the Compute Canada Board to implement the strategic plan at both the national and regional level.

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Mid-Term Review

- An overall lifetime cost-benefit analysis of the acquired systems to inform future infrastructure acquisitions.
  - to determine which sites should eventually receive additional infrastructure. This analysis should take into consideration the cost over the lifetime of the equipment (acquisition + on-going operation). It should also consider any other benefits of placing infrastructure in a given location (redundancy, contribution from an institution, etc.).
- A gap analysis for the need of additional support personnel
  - This analysis should clearly outline the costs and benefits of having more support staff.
- A coordinated plan that would allow the consortium members to better support non-traditional communities and commercial organizations.

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International Review Panel

Professor John O'Callaghan, Australian National University

Dr. David Bailey, Lawrence Berkeley National Laboratory, U.S.A.

Dr. Pete Beckman, Argonne National Laboratory

Dr. Neil Geddes, Science & Technology Facilities Council, U.K.

Professor Lennart Johnsson, University of Houston, U.S.A.

Prof. Dr. Dieter Kranzlmüller, Munchen & Leibniz Supercomputing Centre, Germany

Dr. David Moses, Pittsburgh Supercomputing Centre, U.S.A.

Dr. Rob Pennington, National Science Foundation, U.S.A.

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Strategic Plan 2010-2020

- Compute Canada will integrate HPC facilities and expertise across Canada in order to support world-leading scientific research, by:
- Implementing and maintaining a national platform, including a Tier 1 facility and preparing for exascale computing;
- Undertaking HPC research to ensure that both software and scientific applications can are ready for advances in computer hardware;
- Identifying and supporting the very best science that depends on HPC;

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Strategic Plan 2010-2020

- Serving Canada's existing and planned Canadian and international major science projects (the Canadian Astronomy Data Centre, Sudbury Neutrino Observatory, Canadian Light Source, NEPTUNE/VENUS, TRIUMF, ATLAS, CBRAIN, Genome Canada, Square Kilometre Array, etc.);
- Establishing virtual HPC centres of excellence initially for (i) SMEs (ii)medical research and (iii) humanities and social sciences;
- Developing the Highly Qualified Personnel required to support state-of-the-art HPC equipment and world class research using HPC; and
- Training Highly Qualified Personnel capable of harnessing state-of-the-art HPC equipment to perform world class research and improve the competitiveness of Canadian Industry.

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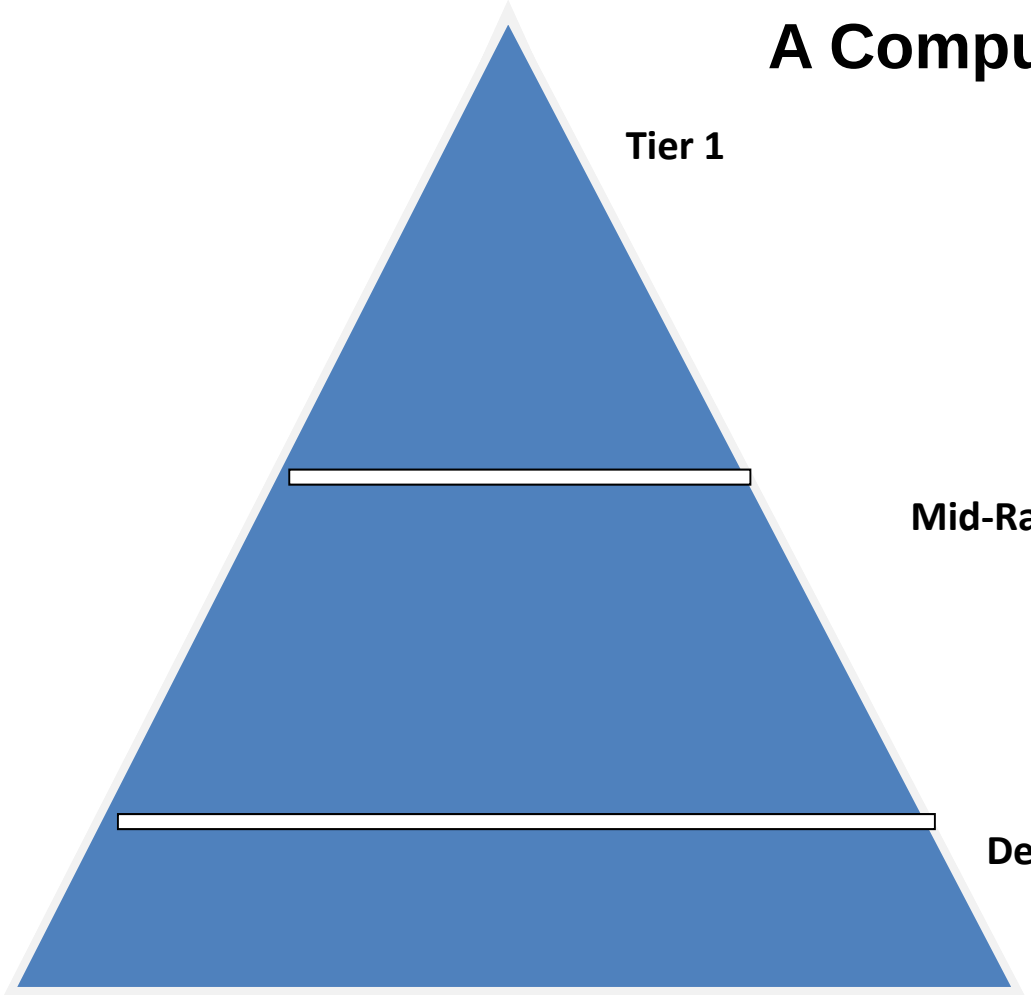
The Computation Pyramid

A Computing Eco-System



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International Collaboration

- NSERC and G-8 funding agencies – preparing for exascale computing (10^{18}calculations/sec)
- Canada's major science projects (SNO/SNOlab; ATLAS; CLS; NEPTUNE; VENUS; CBRAIN; GBRAIN; astronomical observatories) are all HPC dependent
- World-wide LHC Computing Grid
  - 100 million computing jobs every day using CERN data
  - ATLAS Canada provides 5% of the computing resources – computing & storage with Compute Canada

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International Collaboration

Rocky Mountain Supercomputing Centers

- engaging & supporting SME's to use HPC to research and develop new products (wind, water, agriculture, manufacturing, aerospac*e)*

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HPC and the Economy

China Wrests Supercomputer Title From U.S.

"What is scary about this is that the U.S. dominance in high-performance computing is at risk," said Wu-chun Feng, a supercomputing expert and professor at Virginia Polytechnic Institute and State University. "One could argue that this hits the foundation of our economic future." (October 28, 2010 New York Times)

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SMEs

- Canadian SMEs deliver 60% of Canada's economic output, generate 80% of national employment and 85% of new jobs
- Need to be technology leaders not followers (from Council of Canadian Academies report on Canada's lagging productivity)
- Need to create new opportunities in new markets

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SMEs and HPC

- Innovation is an economic process
- Need for new and more efficient ways to serve the needs of customers
- Is HPC important for SMEs?
  - Manufacturing/packaging (Pringles and Folgers coffee)
  - Cost reduction
- What is their incentive to use HPC?
  - Parallels adoption of ICT/e-business
  - Defining/creating ROI
  - Business advantage

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SMEs and HPC

What they can "win":

- New knowledge
- New applications
- New products
- New relationships
- New advantages – competitive, social, well-being

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Working with SMEs

- Internship Program
- Defining a business model
- Defining an R&D model that fits SMEs
- Providing expertise and availability to HPC facilities
- How can we work together to support SMEs?
  - Joint training programs
  - Information seminars

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Let's Talk

THANK YOU

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