To Compete You Must Compute

The following document was submitted by Compute Canada to the Ministry of Industry's Digital Economy Consultation. It received the highest number of votes (463) among all the ideas submitted.

To Compete You Must Compute

High Performance Computing (HPC) or Supercomputing is critical digital infrastructure for productivity, innovation and research and for building and sustaining a digital economy, indeed, a digital society. In the 21st century, countries that want to compete will have to compute.

This will require:

1. Sustained and state-of–the-art supercomputing infrastructure in order that Canadian researchers remain globally competitive and the private sector investment in R&D at Canada's academic institutions results in world-class innovation and competitive advantage in the marketplace.
2. The development of the supercomputing (HPC) professionals – Highly Qualified Personnel – within academia that are required by the private sector to ensure innovation and productivity improvements.
3. Continue d support for academic research utilizing supercomputing and recognition of its contribution to economic prosperity and the health and well-being of Canadians.
4. Positioning Canadian researchers in both academia and in the private sector at the forefront of technological change in supercomputing.
5. Encouraging academic-private sector research partnerships for using HPC for research and for HPC research.

6. The establishment of core funding for supercomputing infrastructure to ensure that Canada becomes a leader in this field and that we are able to attract and retain top talent capable of effectively utilizing this resource.

Canadian researchers depend upon the availability of competitive high performance computing facilities in order to participate in addressing economic, social, and medical challenges in collaboration with researchers in Canada and around the world. If our researchers do not have the tools necessary to support their participation, Canada and Canadians will lose. We will not be the innovators we need to be in a digital economy nor will we be able to effectively address some of the key challenges facing Canadians. At great expense, both economically and socially, we will be adopters rather than leaders; reactive rather than proactive. And we will continue to lag in productivity relative to those countries with whom we compete.

Encouraging Canada's small and medium sized enterprises to adopt and adapt supercomputing for competitive advantage and sustainability will give them leverage in the marketplace. Compute Canada has signed a Memorandum of Understanding with the State of Montana's Rocky Mountain Supercomputing Centers to undertake an initiative to enable participation and competitive advantage in the digital economy for Small-to-Medium-sized Enterprises by providing access to High Performance Computing facilities and expertise. The issue for Compute Canada is how to fund Canada's participation to ensure that our SMEs are digital economy ready. As stated by the United States Council on Competitiveness in the 2008 Report "The New Secret Weapon": "Supercomputing is part of the corporate arsenal to beat rivals by staying one step ahead of the innovation curve."

Computers have re-invented everything we do. Supercomputers are re-inventing how research is conducted and accelerating the timeframe for that research. Some businesses are already using HPC to advantage. The movie industry uses HPC for animation and rendering of special effects; retailers regularly use data mining; and credit card companies use HPC for fraud detection. Simulations to design chemicals that help the immune system fight bacteria now take 3 months on one of Compute Canada's new supercomputers rather than the more than ten years it would have taken without it. The Canadian academic environment and Compute Canada are prepared to work with the private sector through investment in R&D to realize such order of magnitude impacts on the Canadian economy.

High Performance Computing, or Supercomputing, is a very specific component of Canada's digital infrastructure. It is the critical vehicle for creating knowledge from the vast amount of data being collected or generated. In an era of sophisticated modeling of complex systems and the necessity of analyzing massive datasets, it is vitally important to understand the importance of HPC to a modern knowledge-based economy. If modern optical networks are the 21st century equivalents of roads and

railways, then HPC corresponds to the major cities that generate and use the products that flow on these transportation arteries … and that produce the wealth of nations.

Compute Canada is leading the creation of a powerful national HPC platform for research. This national

platform integrates High Performance Computing resources at seven partner consortia across the country to create a dynamic computational resource.