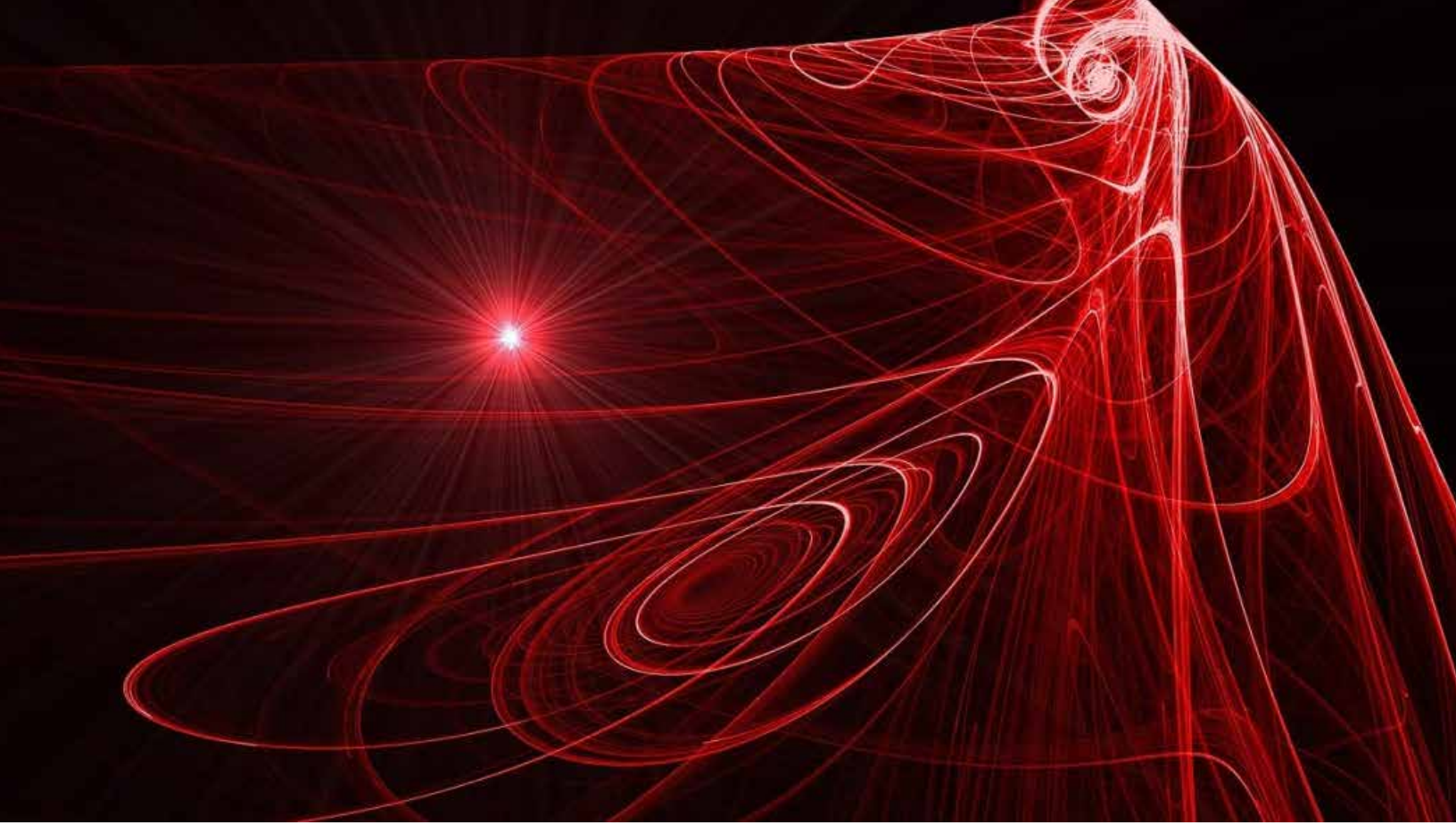


compute
canada

Digital Research Canada
Briefing



Who We Are

Compute Canada, a national non-profit organization incorporated in 2012, plans and oversees pan-Canadian advanced research computing (ARC) resources used for big data analysis, visualization, data storage, software, portals and platforms for research computing serving the majority of Canadian academic and research institutes. We serve more than 70 institutions and 10,000 researchers across the country. We support all sectors of the Canadian research enterprise including environmental, transportation, advanced materials, life sciences and genomics research – some of the fastest growing foundational and applied research areas in the world. These sectors all require access to computational resources that are too extensive and costly for them to maintain on their own.

We help to accelerate competitive tangible outcomes from Canadian research investments, and bridge research to industry careers. Without facilities like ours, no serious, world-class research is possible. ARC is the foundation of information-based science and technology, and a key ingredient to international economic competitiveness by knowledge-based industries.



Canada's Challenge

The Government of Canada invests more than \$2.5B per year in research through grant-based funding programs to researchers outside government. This investment supports research across a wide range of disciplines and application areas that rely on ARC. However, there is currently no coordination between federal investment in research, and investment in this key enabling infrastructure. As a result, capital investment in the national ARC platform has been irregular and inadequate to support the research community. In 2016, Compute Canada could only allocate an average of 57% of technically reviewed and validated compute requests from federally funded researchers (down from 84% in 2012). This represents a serious shortfall which inhibits the success of existing funded projects. This number is an underestimate of the funding gap as researchers have already adjusted their requests to reflect the known shortfall, rather than requesting what they need to be world-leading in their fields.

As this gap increases, researchers will migrate to where they can find adequate resources, and all our research sectors will face a potential brain drain to our competitor countries. They will take with them the innovations and partnership investments that flow from their work. There are already documented examples of “star” Canadian researchers choosing jobs in other countries, motivated by superior ARC facilities.

Federal government researchers have been in contact with Compute Canada over the last year, seeking the same sorts of resources and support as their academic counterparts. These requests span a wide range of departments including NRC, Statistics Canada, Canadian Nuclear Laboratories, the Canadian High Arctic Research Station, the Canadian Forest Service, the Bank of Canada, Agri-foods Canada, Natural Resources Canada, Fisheries and Oceans Canada, the Canadian Food Inspection Agency and others. The federal government is itself a direct participant in research in many sectors and also appears under-supported in ARC.

Canadian private sector and SME R&D / innovation investments are notoriously weak. Canadian companies are poor adopters of advanced research computing technologies and frequently miss opportunities to use those technologies to innovate and improve their competitiveness. This productivity gap means that our economy is slow to diversify and provide growth and jobs. Worse, without access to advanced data services in Canada, these companies will be left behind their competitors.



Building Innovation Data Infrastructure to Diversify and Grow the Economy

“We need Infrastructure that supports change” – PM Trudeau, Davos, January 20, 2016

In order to increase our global competitiveness and to diversify and grow the Canadian economy, we need to treat Compute Canada as essential national infrastructure, the way advanced networking (CANARIE) was recognized a generation ago, by establishing Digital Research Canada. A robust digital infrastructure environment is as essential to our economic growth as the Trans-Canada Highway or broadband connectivity.

Digital Research Canada will be a common carrier and facilitator to provide open access to academic, government and business research. This new digital infrastructure would be publicly funded, with cost recovery where appropriate. It will be a shared provider of advanced research computing with open access and robust structures for governance and accountability. By providing a common platform for academic, government and industry research, it will promote labour force mobility, encouraging seamless transitions from academia to industry and government.

When fully implemented, the annual federal investment (capital plus operating) required to support Digital Research Canada would be approximately \$350M/year, augmented by funds from provinces, institutions and industry. This total includes roughly equal capital investment in the three supported sectors - academic, government and industry. Federally supported research would be supported by federal investment in ARC, while research funded from non-federal sources would be operated on a cost-recovery basis. This level of investment would be competitive to that made by comparator countries on a per-researcher basis.

The proposal is to phase in the changes in ARC funding. Phase 1 includes an immediate (FY2017) \$90M capital investment. Compute Canada is currently in a building phase, with identified data centres and ongoing public RFPs, allowing this new capital investment to be put to immediate use.

Phase 2 occurs in FY2018 and FY2019 with an additional \$125M in capital investment. Incremental operations investments from the \$30M annual base will cover increased power expenses due to new facilities, as well as expanded support personnel commensurate with a growing user base.

Phase 2 will bring Canada towards competitive footing with our global counterparts, all of whom have already launched their own strategies and resulting investments. For example, a number of programs have been developed to improve SME adoption elsewhere (e.g. iForge at the NCSA in the US, SHAPE and Fortissimo in Europe). Canada needs to catch up.



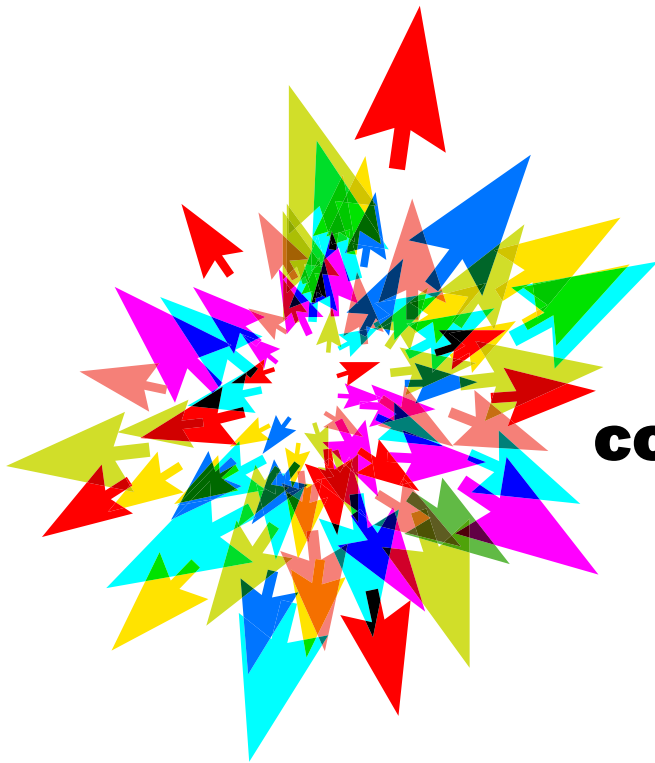
There is potential for tremendous impact.

- Canada's best research programs would be strengthened through the retention of the 200 experts currently working with Compute Canada. This best-in-class work would be expanded to serve the increasing demands of industry and government and assist in broader workforce development through training and internship opportunities.
- DRC would serve an estimated 4,000 academic research groups, 3,000 private sector firms and 3,000 government projects.
- Based on ROI numbers published by IDC, a \$100M investment to provide additional capacity for private sector firms can be expected to generate returns of \$48 Billion in additional revenues and \$4 Billion in incremental profits for those firms.
- Through a close partnership with Canadian research libraries, DRC would build a national research data management (RDM) system promoting the exploitation of open data by Canadian academics and Canadian firms.

Canada has committed to playing a leading role in the knowledge economy and Industrial Revolution 4.0. DRC will be the critical infrastructure needed for developing a data-savvy workforce, growing firms at the forefront of technologies such as "big data", the Internet of Things, cloud computing, smart materials and advanced manufacturing, personalized precision medicine, promoting open government, and making decisions based on the best available evidence.

These goals require a robust national strategy for advanced research computing (ARC) and research data management (RDM). The strategy should take advantage of economies of scale and scope made possible by a national system while incenting investment at local and regional levels. It should ensure that government investments in science and technology are supported by an enabling infrastructure that allows those projects to thrive. Digital Research Canada, with the scope and mandate proposed in this document, can implement such a strategy.





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