The Role of the Universities in Building Canada's Digital Infrastructure for Research

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1. Introduction to the Issue

Research in all fields has changed profoundly over the past decade. It has become more collaborative, increasingly computational, highly multi-disciplinary, heavily dependent on access to large-scale shared facilities, and increasingly reliant on the ability to manipulate and analyze vast amounts of data. As Eliot Phillipson, former President and CEO of CFI, observed, "the iconic image of the lone scientist toiling away in an isolated laboratory … has given way to teams of scientists from multiple disciplines working together to address complex challenges."

As research changes, so too must our supports for it. A robust and comprehensive digital environment is essential for success in today's research landscape. Massive amounts of data come from experiments conducted on "big science" facilities such as synchrotrons, telescopes, medical imagers or gene sequencers and that data must be managed carefully; research in social sciences and humanities has become increasingly computational, with data requirements that have never before been seen in these fields; and researchers in all fields must maintain connectivity with colleagues around the world in global collaborations. Given these new requirements the digital infrastructure (DI) we provide, both within our universities and on a national scale, has become a significant factor in the international competitiveness of Canadian researchers. Eric Gales, President of Microsoft Canada, put it well when he said, "Canada's ability to drive innovation will only be as successful as our digital infrastructure allows it to be."

The term *digital infrastructure* (elsewhere called cyber-infrastructure, e-infrastructure or e-science) refers to the technical infrastructure and special purpose services today's researchers require to do their research. This comprises hardware (computers, servers, storage systems, peripherals, and network and communications equipment); software (operating systems, middleware, and applications) to access, manage, process and transmit information; skilled personnel to develop the hardware and software infrastructure and support its use; and tools to manage research data over its full lifecycle. Policy and governance frameworks are required to ensure that services are provided in an effective and efficient way.

From the perspective of both the researcher and the provider DI should be viewed as a comprehensive, integrated and holistic "ecosystem" comprising high-end computers and servers; low-latency, high-bandwidth networks; repositories of data and tools for full-service data management; software packages and other services supporting research; and highly skilled professionals to develop services, operate and manage the facilities and support the researchers. The technical resources and associated services should be provided to researchers in such a way that the complexity is largely invisible so that they can channel their energies to their research. Despite what many might think, DI is not just a technology issue. To state it succinctly, DI isn't the thing; it's the thing that enables the thing.
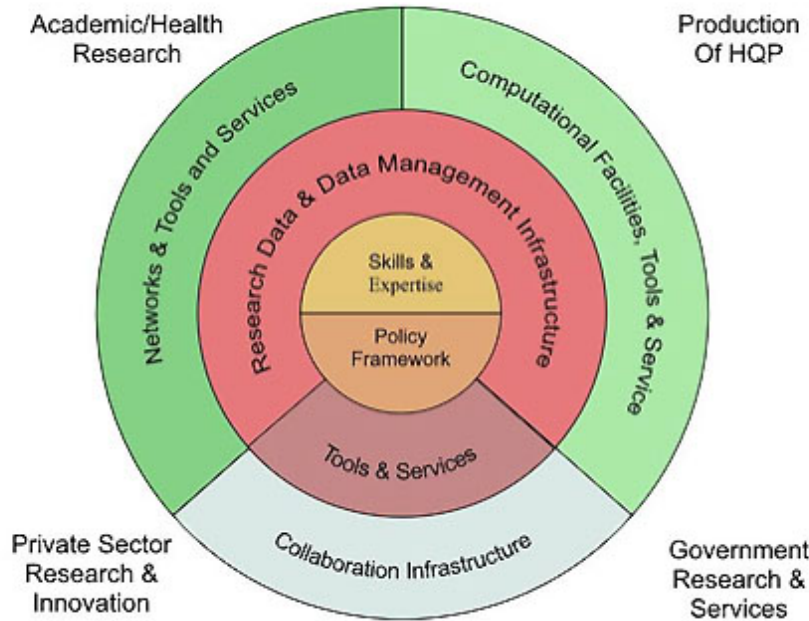
Figure 1: The Elements of the Canadian DI Ecosystem (from DI Summit 2014)

Because university-based researchers drive much of Canadian innovation, Canada's universities have a major role to play in ensuring our researchers have access to the DI they require to remain competitive internationally, but the scale of contemporary requirements can be daunting. It is no longer feasible for even the largest universities to provide the DI needed on their own; nor is it economical for the country to replicate this expensive infrastructure on every "research-intensive" campus. It's both more efficient and more effective to move this from a purely local responsibility to a shared national responsibility, and this is the approach being adopted around the world. For this to happen DI needs to be an element of national research policy guided by a national strategy – a national strategy that ensures that local development aligns with national (and international) activity and guides local investments and local initiatives so that the greatest benefit is returned – to the individual researchers, to the universities and, ultimately, to the country.

The Pillars and the Players

Networking, computing and data management are essential pillars of digital infrastructure. The DI ecosystem also includes specialized facilities and services, collaboration tools and highly skilled support professionals.

Networking is provided to Canadian researchers as an interconnected set of layers. The researcher's first point of contact is the campus network that provides access to network-connected resources throughout the campus. The campus network connects to the regional network, which connects in turn to the national network provided by CANARIE. CANARIE provides access to institutions and research facilities across the country (such as CLS, Neptune, TRIUMF and SNO) and, through bi-lateral agreements, to peer networks around the world so that researchers can use international facilities and services (such as international telescopes and CERN's Large Hadron Collider) and collaborate with colleagues around the world. What's done

with networks is a good example of seamless infrastructure. Few researchers need to know how or where things connect – they just do.

Computing is the second essential pillar of digital infrastructure. Computing resources are provided on campus and they're also available remotely. On-campus resources may be managed by the central IT organization or by individual faculties, departments or laboratories. When computational requirements exceed the capabilities of local resources researchers can look to off-campus resources such as those provided through Compute Canada or other external providers. It shouldn't matter to a researcher where computing facilities are located or how they're managed, simply that they are available to do the job required and accessible from the desktop.

Data management is the third essential pillar. Data drives contemporary research, not just in traditional experimental fields but in all disciplines. While central IT organizations often provide storage services, there's much more to full-service data management than simple storage. Researchers need help both to manage the data they've gathered or generated and to make it available to other researchers to stimulate new discoveries. The effective stewardship of Canada's research data is a national challenge, and we need to address it on a national scale as well. A new agency, Research Data Canada (http://rds-sdr.cisti-icist.nrc-cnrc.gc.ca/eng/index.html), is seeking to organize national efforts in this relatively new area. The Library community is an active participant in data management efforts and through the Canadian Association of Research Libraries (CARL) they are committed to finding and supporting data management initiatives on a national scale.

Table 1: Key Players and their Roles

CANARIE and the 12 regional networks (the RANs) provide national and international networking services to 89 universities, 101 colleges, and 47 CEGEPS; 127 provincial and federal government labs and research parks; 62 hospitals and health networks; 24 cultural institutions; and more than 2,000 K-12 schools. Together CANARIE and the 12 RANs comprise our national research and education network (NREN), which stands among more than 100 NRENs worldwide.
Compute Canada and its 6 partner consortia provide a national high performance computing platform for researchers across Canada.
Research Data Canada (RDC), the Canadian Association of Research Libraries (CARL) and the Canadian Research Knowledge Network (CRKN) are all actively involved in discussions around data management services on a national scale.
The Canadian University Council of CIOs (CUCCIO) represents university IT participation in the national DI ecosystem.
The Leadership Council for Digital Infrastructure (LCDI) is coordinating the national conversation around development of a national DI strategy. More information is provided on the LCDI website (http://digitalleadership.ca/) and in Appendix One of this report.

Universities provide the first layer of DI services for their researchers, as well as the means to access the upper layers. The "business ownership" for research support lies with the VP Research but the CIO and the Library also have substantial roles to play – in technology and data management, respectively.

2. What Needs To Be Done Nationally

Canada has invested heavily in digital infrastructure over the years – on a national scale, in regions, and in individual institutions. Both individuals and organizations have made significant contributions, as have various levels of government, but the development of a true world-class digital environment for research has been impeded by a fragmented and siloed approach to planning for, paying for and ensuring the long-term availability of the various components of the digital infrastructure ecosystem. This needs to change if Canada is to address the requirements of the research community for a world-class digital environment.

Although we've achieved much of which to be proud, Canada's current approach to DI planning and delivery has some serious flaws. A number of recent studies [1, 2, 3, 4, 5, 6] have identified the following.
- Organizational responsibility is fragmented in multiple places, resulting in overlapping jurisdictions, multiple voices and competing priorities.
- The current funding model is not sustainable. Different components are funded in different ways by different agencies (adding to the fragmentation), and funding is episodic.
- Too much of the focus in our planning is on equipment rather than people.
- There is little attention to data.
- There is a significant policy gap.
- The fragmented structure prevents researchers from using the digital infrastructure ecosystem effectively and efficiently.

Canada is in serious danger of falling behind other industrialized nations who have taken a more holistic approach to digital infrastructure at a national level. There is widespread agreement that we need:
- A national vision for digital infrastructure.
- A coordinated approach to its planning and delivery.
- A single locus of responsibility.
- Predictable and ongoing funding to sustain success, preferably from a single source.
- Significant engagement from the university sector.
- A long-term strategy against which regional or institutional investments can be planned or optimised ("plan nationally, implement locally").
- A policy framework.
- An effective governance model.

Challenges

Various organizations (see Table 1 and Appendix Two) provide DI elements now, but they are planned, governed, operated and funded as independent silos. Although they may try to cooperate with each other their focus is on their own respective mandates. There is no overarching strategy, structure or policy to ensure the level of integration needed to provide the support contemporary research requires in a cost-effective way. This needs to change. Seeing things through the DI ecosystem lens can enable us to move forward with a common agenda so that the investments required return the greatest benefit.

University leaders across the country need to be engaged too. There is strong support from the IT organizations, but that's not enough. Our Presidents and Provosts either are unaware of DI initiatives and their importance or (and) they are focused on other pressing issues. Their absence

from the national conversation has been noted and is problematic. Gaining the attention and the support of the senior administrative leadership of research-intensive universities is crucial to advancing success.

While this is a new approach for Canada, there are well-developed international models from which we can learn [11]. From my own investigations I have concluded that Canada needs to take the following steps to establish an internationally competitive DI ecosystem:
- Create a national vision for digital infrastructure and a strategy for realizing that vision.
- Ensure that key stakeholders work together: universities, CFI, tri-council agencies, Compute Canada, CANARIE, CUCCIO, CARL/CRKN, industry, federal government, provinces, ...
- Stabilize, synchronize and unify the funding.
- Simplify the governance. Bring current entities closer together, perhaps even into a single organization.

A coordinated national approach offers a number of benefits, including the following:
- A single unified voice for all aspects of digital infrastructure.
- One-stop shopping for researchers.
- Balanced investment across the components of digital infrastructure (not competition).
- Better leverage of installed infrastructure, including the ability to evolve in a planned way as requirements change.

Much Has Been Happening

Three National Summits
Two National Summits on Digital Infrastructure:
- In Saskatoon in June 2012 [9, 10].
- In Ottawa in January 2014 [11, 12, 13, 14].
Canadian Research Data Summit (Mapping the Data Landscape):
- In Ottawa in September 2011 [7, 8].

What's emerged from the two DI Summits:
- From the first: the formation of the Leadership Council for Digital Infrastructure (LCDI):
  - The LCDI brings together key stakeholders (including service providers, associations and organizations, granting agencies, government) to advance a national DI program. The participants (see http://digitalleadership.ca/about-the-leadership-council/participants/ for a complete list) are articulating a shared direction and gaining the attention of key government agencies (most notably Industry Canada and the funding agencies). The co-chairs are Steven Liss, VP Research at Queen's University, and Jay Black, CIO at Simon Fraser University.
- From the second: a number of initiatives (pilots/demonstrations) focussed on research data management (RDM) with assigned responsibilities.
  - Create a catalogue of existing services (CANARIE, Compute Canada, RDC).
  - Create a developmental and demonstration pan-Canadian research data management (RDM) network (CARL, CRKN).
  - Create an RDM pilot focussing on specific RDM protocols and technology requirements for three pilot domains: Astronomy, Social Sciences and Medical Genomics.

- o Coordinate with the CRKN Integrated Digital Scholarship Ecosystem (IDSE) project [15].
- o Develop and support an RDM metrics project (RDC).
- o Investigate a "DI Trust" involving government, universities and the private sector (responsible: a small group of senior leaders from the respective sectors).

CFI's $50 million cyber-infrastructure initiative [16]

- • CFI has invested close to $300 million in the national computing platform since 2006, has been an active participant in the national DI conversations from early on, and has stated that "cyber-infrastructure underpins leading-edge research across all fields of inquiry, from the social sciences and humanities to the health and physical sciences through to engineering." The 2013 federal budget announced CFI's intention to support Canada's DI efforts through this new program to provide "communities of researchers an opportunity to work closely with data scientists and tool developers, as well as with Compute Canada, to devise optimal ways of organizing, categorizing and analyzing their data resources."

Compute Canada's Sustainable Planning for Advanced Research Computing (SPARC) program

- • Compute Canada has just announced its Sustainable Planning for Advanced Research Computing (SPARC) program "with a particular focus on [research] sectors that are highly dependent on digital infrastructure." In part this is to prepare the Compute Canada community for its involvement in CFI's cyber-infrastructure initiative, but "SPARC will look beyond the upcoming CFI call to chart a sustainable plan for cyber-infrastructure in Canada through to 2022."

CANARIE's new strategic plan

- • CANARIE has recently developed a new five-year strategic plan to guide its activities from 2015 to 2020. The plan is organized around 5 key objectives, the fourth of which is to "Strengthen Canada's Digital Infrastructure Ecosystem." CANARIE also provides financial support for Research Data Canada.
- • CANARIE has introduced an innovative Research Platform Interface program in order to drive stakeholder development of "reusable research software … for big data analysis tools and platforms in support of research, discovery and innovation."

AUCC's working group on digital infrastructure

- • The Association of Universities and Colleges of Canada (AUCC) has just established a working group to investigate digital infrastructure in Canada and the role of AUCC and university presidents in developing a solution to current issues. The chair is Suzanne Fortier, Principal of McGill University. The full membership of the group is given in Appendix Three.

3. The Role of the Universities

A healthy national DI ecosystem begins with healthy local equivalents. Effective local services for our university-based researchers will position them well for national services. At present the landscape at the local level across the country is very uneven. While some institutions have undertaken initiatives to bring together their internal stakeholders to advance DI for research at the institutional level, for others, the conversation has yet to occur (in fact, even the need for a conversation is not well understood or accepted). Universities must give high priority to DI planning, both on campus and at the national level, and university leaders must take a leadership role. Solutions developed collectively will benefit everybody.

What Universities Should Do On The Local Scene
1. Put together the structures necessary for effective local DI planning. The VPR and the CIO should lead this planning jointly. National planning will be informed by effective local initiatives.
2. Catalogue existing DI services for researchers, including those offered nationally (CANARIE, Compute Canada, RDC) as well as those offered locally.
3. Consider developing a "concierge service" for researchers, offering easy access to DI tools and services (both on- and off-campus) to support the research process from start to finish.
4. Develop local research data policies that are compliant with emerging tri-agency requirements, and researcher-friendly services and processes to ensure data management compliance. Ensure that the training, encouragement and incentives necessary for researchers across campus to use these services are provided. Bring expertise in the Library into play in the development of the data management services.
5. Deliver a strong "we are here for you" message and work hard to gain the trust of the research community. Because this is a new approach for many users the quality of the user support will be a key factor.
6. Ensure the active engagement of the President, the Provost and the VPR in DI conversations and initiatives on campus.

What Universities Should Do On The National Scene
1. Be active participants in national events and conversations at all levels.
2. Ensure that presidents, provosts and VPRs are actively engaged in national DI conversations and initiatives (not just the CIOs). Emerging interest in both the AUCC and the U15 is a good start but we need to press hard to continue building momentum.
3. Support the work of the Leadership Council for Digital Infrastructure, both in spirit and in dollars.

4. Recommendations

Although the pace of progress may be slower than many would like it's clear that a new vision for DI in Canada is emerging, a vision that embraces a unified national approach in support of research in all disciplines. Organizations and service providers are aligned in their advocacy, granting agencies are introducing new programs and the conversation is now focussed on delivering an integrated set of services coordinated on a national scale. There is still a great deal of work to be done but there is an excellent opportunity for universities to take a leadership position, both by developing a new on-campus service model for our own researchers and by active participation in emerging national initiatives and programs.

It is recommended:
1. That the VPs Research, along with the CIOs, engage key campus stakeholders to
   - articulate a shared campus vision for digital infrastructure for research with clearly identified central responsibilities,
   - identify the resources needed and develop a strategy for securing them from both internal and external sources,
   - develop an implementation plan (some immediate steps are suggested in Section 3), and
   - clarify lines of accountability for research infrastructure generally and digital infrastructure specifically.
2. That steps be taken immediately to address policy gaps on campus and to ensure that accountability for research support is well understood.
3. That the CIO be tasked with leading the development of a researcher-friendly suite of internal DI services for researchers, offering easy access to both on-campus and off-campus resources, beginning with tools for research data management across the full lifecycle.
4. That active participation of senior institutional leaders (not just CIOs) in national DI events and conversations at all levels be strongly encouraged, including national research data management initiatives and the work of the Leadership Council for Digital Infrastructure. This will simultaneously help the advance of national initiatives and influence on-campus priorities.

A strong "do it yourself" culture is a significant impediment to progress that will need to be overcome for this to succeed. Researchers are fiercely independent and resistance to centrally delivered services, especially in research, is very strong. There will be many sceptics. We can win them over by good service (the "carrot") but institutional policy will be necessary to get their attention (the "stick"). Gaining and maintaining their confidence will require continued attention and assurances that we're in this for the long term.

Finally, it's important to say again that the active engagement of the President, the Provost and the VPR in DI conversations and initiatives, both on campus and nationally, is vitally important. With a few exceptions the engagement of these leaders has been lacking. It's not about the technology. The engagement of senior leadership will be a strong signal to both the campus researchers and government that DI for research needs to be a priority.

Appendix One

The Leadership Council for Digital Infrastructure Integration (LCDI)

The first National DI Summit in Saskatoon (2012) concluded with a commitment to establish the Leadership Council for Digital Infrastructure Integration (LCDI). The Leadership Council, co-chaired by Steven Liss, VP Research at Queen's University, and Jay Black, CIO at Simon Fraser University, was given the following tasks:
- to generate a vision statement and a set of principles based on the discussions at the Summit;
- to review, refine and execute a proof of concept project with the objective of identifying the gaps in the current ecosystem;
- to develop a plan for action and an overall roadmap;
- to identify, and where appropriate, execute the actions required to address the gaps;
- to document the strategy required to ensure buy-in and support from the community; and
- to develop the strategy and mechanisms required to ensure the resulting strategy is used to inform the decisions of the appropriate agencies and organizations.

From the LCDI Website

Canada's advanced digital infrastructure ecosystem is holistic, integrated and includes:
- A Framework – the policies and legal framework within which digital research is undertaken that includes coordination and alignment of various components of the digital research environment; the suitability of funding systems for e-research; and the capacity of Canada to deal with other international players in digital research;
- Expertise and Skills – the sufficiency and quality of skilled personnel for effective use of the e-infrastructure;
- Tools and Services – the software, applications and human support services that enable researchers to derive value from their data and to optimize the use of the digital infrastructure;
- Research Data Management– the collecting, structuring, standardizing, archiving, and sharing of data, while ensuring flexibility, security, accessibility, interoperability, affordability, and high performance of the system;
- Computational Resources – hardware, software and service resources that enable both compute-intensive and data-intensive research, including both Cloud and Grid computing;
- Networks – the means by which researchers are connected, linking researchers to data sources, and transporting data among different locations; and
- Collaboration – the means of connecting researchers within research initiatives that are geographically dispersed and/or are utilizing common datasets and tools.

A New Model for Digital Infrastructure in Canada

Canada's competitiveness in the worldwide digital economy hinges on its success in research, innovation and education, which, across all disciplines, is increasingly reliant on digital infrastructure to support research and development.

This "digital infrastructure" includes:
- Low-latency, high-bandwidth networks;
- A wide range of network-accessible research equipment and digital devices;
- High performance computers and servers;

- Facilities for full-service research data lifecycle management, encompassing data collection, data storage, data sharing, metadata, search, provenance, data archiving, data security, etc.;
- Middleware and related software tools to integrate the infrastructure and facilitate its use;
- Technical staff to develop the hardware and software infrastructure and support its use;
- Staff with the analytical and modelling skills needed by researchers, students and private sector innovators to effectively leverage the digital tools.

Canada has some elements of this infrastructure in place now, but to compete effectively with jurisdictions in the United States, Europe, and Asia, who are investing heavily in next generation digital infrastructure, will require an integrated national approach that is responsive and nimble to oversee the construction and adoption of a new national project on a scale with, and essentially equivalent to, past transportation and communications megaprojects that have defined this country since its inception.

Vision
- A unified national approach to the promotion, planning, acquisition, operation and governance of digital infrastructure in support of research in all disciplines.
- An integrated set of services coordinated on a national scale.

Why
- Components of digital infrastructure that were viewed as independent pieces in the past (e.g., networking, computing, data management) are now strongly intertwined.
- There is a need to move beyond ad-hoc fragmented development of individual elements of the digital ecosystem to a more holistic approach.
- Structures put in place years ago are no longer sufficiently effective in today's context.
- There is both an opportunity and a need to simplify the operational, governance and funding environment.

Advantages
- Simplified environment for researchers.
- Simplified interactions with the universities.
- Unified voice to SSHRC, NSERC, CIHR, CFI, Industry Canada, Health Canada, …
- Economies of scale can be realized.
- Better value for money invested by federal and provincial governments, granting agencies, CFI, post-secondary institutions and the private sector.
- Clear responsibility and accountability for the entire DI picture.

Participants

The LCDI brings together leaders from across the country, representing a variety of interests, including: computational resources, broadband delivery, research data management, standards, research and libraries.

UNIVERSITIES
Vice-Presidents of Research
Chief Information Officers
Researchers
Representing universities on the Leadership Council are the Co-Chairs, Jay Black PhD, Chief Information Officer, Simon Fraser University and Steven Liss PhD, Vice Principal Research, Queen's University.
Representing the Researchers on the Leadership Council are Ray Siemens from the University of Victoria and Geoffrey Rockwell from the University of Alberta.

SERVICE PROVIDERS
CANARIE – Canada's Advanced Research and Education Network
Compute Canada
CRKN – Canadian Research Knowledge Network
CASRAI – Consortia Advancing Standards in Research Administrative Information
Representing CANARIE on the Leadership Council is Jim Ghadbane, President and CEO.
Representing Compute Canada on the Leadership Council is Mark Dietrich, President and CEO.
Representing CRKN on the Leadership Council is Donna Bourne-Tyson, Board Member, and Clare Appavoo, Executive Director.
Representing CASRAI on the Leadership Council is David Baker, Executive Director.

ASSOCIATIONS AND ORGANIZATIONS
RDC – Research Data Canada
CARL – Canadian Association of Research Libraries
CFHSS – Canadian Federation of Humanities and Social Sciences
CUCCIO – Canadian University Council of Chief Information Officers
Representing RDC on the Leadership Council is Pam Bjornson, Director General, NRC and RDC, and Walter Stewart, RDC Coordinator.
Representing CARL on the Leadership Council is Gerald Beasley, Board Chair.
Representing CFHSS on the Leadership Council is Ray Siemens.
Representing CUCCIO on the Leadership Council is Jay Black, President.

OBSERVERS
The Leadership Council benefits from the presence of the funding agencies (NSERC, SSHRC, CIHR and CFI) and Industry Canada as observers to all formal meetings of the Leadership Council.

Appendix Two

Organizations Playing Key Roles in the Present DI Ecosystem

CANARIE	Compute Canada
• Provides a high speed national network connecting a set of regional networks (RANs) and international peer networks. • Funded by Industry Canada, usually in 5 year cycles; the last cycle was a 3-year cycle (2012-15). • Introduced the Research Platform Interface program to drive stakeholder development of "reusable research software."	• Oversees high performance computing facilities supplied through 6 partner consortia supporting research in all 10 provinces. • Funded by CFI, originally through the National Platforms Fund program (2006), with provinces matching CFI funding with funds to consortia. • Presently sponsoring the Sustainable Planning for Advanced Research Computing (SPARC) project.
CUCCIO (university ICT)	**CARL/CRKN** (data)
• University ICT provides the immediate contact point for researchers. • CUCCIO member institutions are represented by their CIOs. • Convened the first National DI Summit (2012).	• Expertise in data management, including data curation and data delivery. • Several years ago CARL coordinated a proposal intended for CFI for a national collaborative Research Data Management infrastructure (the Canadian National Collaborative Data Infrastructure project [22]) but it failed to gain the support of the U15 VPRs. Undaunted, CARL launched Project ARC in March 2014 in conjunction with Research Data Canada, to "create a discipline-agnostic network for research data management." • CRKN is coordinating a new national project: the Integrated Digital Scholarship Ecosystem (IDSE) project [15].
HPC Consortia	**RANs**
• Compute Canada oversees the activities of 6 partner consortia; the U of S is a member of the WestGrid consortium.	• CANARIE works closely with 12 regional networks (Regional Advanced Networks, or RANs) to deliver the advanced networking capability required by Canadian researchers. RANs connect users inside a province, while CANARIE connects these researchers to others across the country and around the world.
Granting agencies (TC3+)	**Industry Canada**
• Our major federal granting agencies (CFI, NSERC, SSHRC, CIHR, Genome Canada – collectively referred to as TC3+) have mandates and programs that directly and indirectly support research infrastructure. TC3+ conducted a broad consultation on digital infrastructure [18] in 2013.	• Industry Canada directly or indirectly (through the granting agencies) supports CANARIE, Compute Canada, CRKN, RDC and universities. • Minister James Moore released the Digital Canada 150 strategy document [26] in 2014. It specifically references funding to CFI in support of digital infrastructure for research. • A lot of interest in the DI file within the Science and Innovation sector (the sector responsible for the granting agencies) and within Industry Canada more generally.

Appendix Three

The AUCC Digital Infrastructure Working Group

The Association of Universities and Colleges of Canada (AUCC) has constituted a new working group to investigate digital infrastructure in Canada and the role of AUCC and university presidents in developing a solution to current issues. The members of the working group are:

- Suzanne Fortier, Principal, McGill University (Chair)
- David Barnard, President, University of Manitoba
- Eddie Campbell, President, University of New Brunswick
- Elizabeth Cannon, President, University of Calgary
- Sara Diamond, President, OCAD University
- Feridun Hamdullahpur, President, University of Waterloo

Terms of reference are not available yet.

Appendix Four

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