



CANARIE ANNUAL REPORT

for
Innovation, Science and Economic Development (ISED)
Canada

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1.0 Overview

Context for CANARIE

CANARIE's role in Canada's innovation ecosystem was set out in its 1993 Articles of Incorporation, and reiterated in its 2013 Articles of Continuance: *to contribute to Canadian competitiveness in all sectors of the economy, to wealth and job creation and to the quality of life of Canadians.*

Throughout its history, CANARIE has evolved to support Canadian competitiveness through the development and deployment of digital technology for Canada's research, education and innovation communities. Over the course of its 25-year history, CANARIE has helped shape Canada's digital landscape by leading the following initiatives, among many others:

- laying the groundwork, with provincial partner networks, for the first commercial Internet in Canada;
- incubating the Internet Registration Authority in Canada, now known as CIRA;
- supporting hundreds of Canadian businesses, educational and health organizations in their transition to digital models and processes via the Technology Development, Technology Diffusion Program; Technology Applications Development Program; and E-business, E-learning and E-health Programs;
- identifying gaps in research software and championing the development of powerful research software tools to accelerate discovery;
- working with global peers to align international research and education infrastructures to support globally collaborative research; and
- developing the grid certificate authority in Canada that provides secure access to data generated from the Large Hadron Collider and other advanced digital technologies.

CANARIE's activities serve to continually advance Canada's digital infrastructure for research, education and innovation so that Canadians are positioned to compete in the global knowledge economy. More detailed information on current activities may be found below.

Executive Summary

CANARIE's Contribution Agreement with Innovation, Science and Economic Development (ISED) Canada requires the organization to "provide to the Minister, by July 31 of each Fiscal Year, beginning in 2016, an Annual Report approved by the Board, in both official languages relating to the previous Fiscal Year." This report addresses those requirements.

Over the past year, CANARIE has executed on all eligible activities outlined in its 2018-19 Business Plan. These eligible activities align with CANARIE's core purpose: **the advancement of Canada's knowledge and innovation infrastructure**, and its mission: **to design and deliver digital infrastructure, and drive its adoption for research, education and innovation**. At a high level, through its programs, CANARIE works towards achieving these objectives by:

- overseeing the ongoing evolution of Canada's National Research and Education Network (NREN);
- championing the development of research software, research data management, and collaboration tools; and
- providing users in the private sector with access to advanced technologies to accelerate their time to market.

Together, these activities align to deliver more integrated and accessible digital research infrastructure, tools and services. Beyond these activities, CANARIE also champions the evolution of Canada's digital research infrastructure, which is a critical lever driving social and economic gains that benefit all Canadians.

Network Evolution

As the primary role of the CANARIE network is to provide interprovincial and international connectivity for Canada's National Research and Education Network (NREN), CANARIE works closely with provincial and territorial network partners that build and operate regional networks in their province or territory to co-deliver services to the Canadian research and education community. Through a governance structure which is led by the NREN Governance Committee, this successful federal/provincial partnership manages the evolution of the NREN as a whole to ensure that Canada's research, education and innovation communities can access nationally and globally distributed data, tools and colleagues.

CANARIE understands the impact of increasing amounts of digital data on research, education and innovation, and has evolved the national backbone network to ensure Canada's research and education community can continue to access and leverage these data to support world-class research. Data traffic grew at approximately 37% from FY18 to FY19.

Given the foundational nature of the network to a wide range of research, education and innovation activities, CANARIE focuses on both its core network and the ongoing strategic evolution of Canada's NREN. Of particular note is the on-going execution of the NREN Strategic Plan, the first such plan created, and a significant milestone in the strong federal-provincial partnership that is the cornerstone of Canada's NREN.

CANARIE continues to represent Canada in the international advanced networking community, participating actively in the NREN CEO Forum, the Global Network Architecture (GNA), and the Global Lambda Integrated Facility (GLIF), a global consortium working on technical advances to improve the capacity of fibre networks. CANARIE's participation in these communities ensures that Canada's digital research infrastructure evolves to enable Canada's research and education communities to participate and lead globally collaborative research.

CANARIE supports mission-critical research at a range of government laboratories. As well, a CANARIE representative sits on Shared Services Canada (SSC)'s IT Infrastructure Roundtable to provide unbiased information and expertise to assist SSC in network and network-based services planning and execution. CANARIE is increasingly called upon to provide objective advice to government partners regarding new technology initiatives and opportunities for Canada.

Collaboration Tools

Under the Canadian Access Federation (CAF) service umbrella, CANARIE enables Canadian students, staff and faculty to securely access remote resources using only their username and password from their home institutions. This service enables seamless access to protected online content, and to campus Wi-Fi networks through *eduroam*. CANARIE continues to see significant growth in the use of these services and to evolve the technical and administrative infrastructures to support Canada's increasingly mobile cohort of staff, students and faculty.

Use of the *eduroam* service continues to grow rapidly; the 224.6 million inter-institutional sign-ons to the service in 2017-18 increased to 276 million in 2018-19, an increase of 23%.

CANARIE's CIO Advisory Committee plays a key role in guiding the evolution of these and other network services.

Research Software

Recognizing that software is essential infrastructure to support access to data and its computation, CANARIE has invested in research software tools since 2007. CANARIE's long-term vision is to develop a robust toolkit of reusable software services that are widely adopted by Canada's research community. Through its Research Software Program, CANARIE has spearheaded the development of 72 reusable software tools, and is now supporting the onboarding of new researchers onto existing research software tools. In order to maximize the impact of these investments, these software tools are available to all researchers.

CANARIE's most recent funding calls have supported the modification and maintenance of existing research software platforms to meet the needs of new research teams.

Members of CANARIE's Research Advisory Committee and Software Technology Advisory Committees, which have representation that includes the private sector, ensure CANARIE's investments in software are directed towards the most useful software tools, and that these tools meet rigorous technical standards.

Research Data Management

Subsequent to CANARIE's 2015 mandate renewal, CANARIE has been providing funding for Research Data Canada and its programs, enabling opportunities for greater integration of the elements of digital research infrastructure. RDC's Executive Director works with stakeholders to develop the policy frameworks that enable reuse of research data resources. This initiative not only represents an opportunity to address a gap in Canada's digital research infrastructure, but also leverages and informs CANARIE's Research Software, Canadian Access Federation, and DAIR programs.

Most recently, CANARIE launched a Research Data Management program, to fund the development of national data management tools and software. Launched in January 2018, a community consultation identified gaps in the Canadian research data management ecosystem. The results of the consultation, reviewed by the CANARIE Research Data Management Advisory Committee, identified priorities for the funding call launched in May 2018. As a result, 9 research teams will receive up to \$3.2 million in funding to develop software components and tools to enable Canadian researchers to adopt best practices in managing data resulting from scientific research.

Private Sector Innovation

CANARIE enables users in the private sector to leverage its digital infrastructure to accelerate the commercialization process. The Digital Accelerator for Innovation and Research (DAIR) Program has supported over 1,200 small and medium-sized enterprises (SMEs) to test and develop a range of novel ICT products and services. The DAIR Program provides SMEs with an opportunity to benefit from the scale and agility of cloud resources (computing and storage resources that are located in distributed data centres). Deploying these advanced technologies provides businesses with an opportunity to test and develop innovative products without any capital expenditure, which both speeds time to market and reduces development costs. Further, the opportunity to deploy cloud technologies in early product development is a powerful demonstration of how these technologies can transform traditional business models, and serves to further incentivize businesses in adopting cloud technologies as part of their long-term business strategy.

Through partnerships with other organizations such as the Fundica Funding Roadshow, CANARIE continues to promote the use of DAIR and the transformative power of cloud technologies. A range of case studies, published on the CANARIE website, highlight these businesses' use of DAIR and the tangible competitive value delivered through the use of cloud infrastructures to the SME community.

To advance Canada's leadership in networking technology, CANARIE is a founding partner in the Centre of Excellence in Next Generation Networks (CENGN). CENGN is a consortium of industry, academic and research leaders who are pooling their expertise and equipment to enable SMEs to test new products at scale, with the goal of accelerating the commercialization of Canadian networking technologies in the global marketplace. CANARIE continues to provide the critical network infrastructure and connections to stakeholders in the private and public sectors that underpin CENGN.

Partnerships and Community Engagement

CANARIE continues to engage with a broad range of stakeholders to ensure its activities align with changing community needs. CANARIE was a member of the Leadership Council for Digital Research Infrastructure, and a member of its executive committee; and is in regular contact with digital infrastructure partners and stakeholders, including the CFI, Compute Canada, Universities Canada, the U15, CUCCIO, CAUBO, Colleges and Institutes Canada, Genome Canada, and the granting councils.

CANARIE's role in the digital research infrastructure landscape continues to solidify through premier events such as the CANARIE National Summit, speaking opportunities for CANARIE staff at provincial, national and international events and conferences, through ongoing updates to its corporate website and with outreach/educational materials.

On behalf of the Board of Directors, CANARIE would like to thank the Minister and officials at Innovation, Science and Economic Development Canada, for their continued support and confidence in CANARIE. CANARIE looks forward to providing Canada's research, education and innovation communities in the public and private sectors with world-class digital research infrastructure, so that Canada can grow its innovation capacity and compete and win in the global digital economy.

2.0 Statement of Eligible Activities for 2018-19 and Report on the Extent to Which CANARIE Met the Expected Results

The overarching goal for CANARIE activities during its 2015 – 2020 mandate period is to strengthen Canada’s digital research infrastructure. CANARIE’s activities throughout the fourth year of its mandate aligned to this goal, and contributed to a greater integration and accessibility of digital research infrastructure, tools and services.

CANARIE’s three eligible activities in the 2018-19 Business Plan are detailed below. A report on the extent to which each eligible activity was achieved is contained in the paragraphs following.

1. Network Operations

Evolve/extend Canada’s world-leading collaboration network

In order to address the evolving needs of users in research, education and innovation communities, CANARIE will enable a pan-Canadian collaboration capability through a world-leading high performance network and network-based services.

CANARIE Network:

Overview of the Network Evolution Strategy

To evolve and expand the CANARIE network in a flexible and cost-effective manner over the long-term, CANARIE’s vision is to deploy fibre, where economical, from coast-to-coast across Canada. In high-use, high-growth network corridors, CANARIE has purchased long term use of fibre and therefore has the flexibility to add capacity and deploy transformative technologies at a considerably lower incremental cost. To further build out the network, CANARIE uses leased services from suppliers where the traffic demand does not warrant dedicated fibre, or when fibre acquisition is cost prohibitive.

Deployment of additional network capacity to meet the growing traffic need

In anticipation of traffic growth for the coming years, CANARIE approved a project to add an additional 100G path along the southern route of the network from Seattle via Victoria to Montreal. This addition results in a 200G capacity which maintains uncongested high-speed access across the country and to the rest of the world. CANARIE collaborated on this project with ORION (Ontario) and RISQ (Quebec) to co-deliver a section of the network. The collaboration also increased reliability of the network by use of diverse routing.

Improved core node reliability

CANARIE continues to improve core node reliability. In 2017-18, a second CANARIE node in Winnipeg was created. This year, a second CANARIE node in Toronto was deployed at York University. These two new nodes improve the reliability of the overall network, and the availability of delivering CANARIE services to ORION (Ontario) and MRnet (Manitoba) significantly. Once fully deployed in June 2019, these deployments limit the impact of node outages on service delivery to these two regions, and for traffic travelling through Toronto and Winnipeg.

The top five CANARIE network users in 2018-19 were: TRIUMF, Simon Fraser University, SHARCNET, University of Alberta, and University of Calgary

Improvement of network security monitoring and measurement system

CANARIE participated in, and facilitated, the first ever national procurement for the NREN. This initiative, based on the NREN strategic plan, supported the purchasing and deployment of the same Security Information and Event Management tool across all thirteen partners in the Canadian NREN. The procurement was finalized in 2018-19, and deployment is expected in 2019-20.

Deployment of the Software Networking Pilot

CANARIE collaborated with our international Advanced North Atlantic (ANA) partners in piloting an open source software application for provisioning a point-to-point service over MOXY, Canada's Global Exchange Point for research and education. The application allows ANA partners to trigger the provisioning capacity through ANA infrastructure across multiple administrative domains. The pilot demonstrated that software application reduced the provisioning time (from days to minutes) and streamlined the operation process among NREN Network Operation Centres (NOCs).

Deployment of support tools accessible through the user portal

CANARIE developed two new *eduroam* reporting features that allow more control over the types of reports that can be produced. During the year, two new institutions supporting *eduroam* were added to the portal system.

Continue to support connections to government research facilities that meet the performance needs of the government science community

CANARIE continues to work with Shared Services Canada (SSC) on building the Government of Canada Science Network (GCSN). Nineteen (19) federal science laboratories were migrated to GCSN in 2018-19, and SSC plans to complete the migration of all connected federal laboratories by the end of 2019-20.

Other Achievements – Network:

International Partnerships – NREN CEO Forum

CANARIE continues to participate as a member of the Global NREN CEO Forum. This forum brings together the CEOs of 17 national research and education networks to collaborate on the global evolution of critical digital infrastructures and associated services.

International Partnerships – Global Network Architecture

CANARIE has been actively involved in the Global Network Architecture (GNA) initiative with the goal of defining a reference architecture and creating a roadmap for both national and regional research and education networks to more seamlessly support research. Ultimately, this effort will establish more capable, predictable, cost-effective and resilient next-generation global connectivity for research and education. CANARIE acts as both a co-executive sponsor and as co-Chair of the GNA Policy and Strategy Working Group, which works to define fair use of the global connections, cost sharing, and the like.

International Partnerships – Global Lambda Integrated Facility

CANARIE's President is Co-Chair of the Global Lambda Integrated Facility (GLIF). This is an international consortium that leverages the existing networks amongst NRENs to develop and pilot next generation technologies (such as Science DMZ and Software Defined Networks) in order to maximize network throughput as link speeds increase. During 2018-19, the decision was made to merge GLIF with GNA in an effort to streamline the evolution of the Global Research and Education Network (GREN).

Joint Security Project

Following the successful conclusion of the one year Joint Security Project pilot, a summary report of lessons learned and possible next steps was prepared and submitted to ISED. The key takeaway of the report is that threat sharing between institutions is both possible and beneficial to all.

NREN Program:

Canada's National Research and Education Network (NREN) operates on a co-delivery model, as a partnership between CANARIE and provincial/territorial Regional Advanced Networks (RANs). CANARIE provides interprovincial and international connectivity, while the RANs provide connections to institutions within their jurisdictions. RAN data that travels out of a province or territory traverses CANARIE network links to RANs in other provinces or territories, or internationally via CANARIE links connecting Canada to the rest of the world.

A coherent technical and strategic evolution of the NREN as a whole is critical to ensure that Canadians from coast to coast to coast have a comparable user experience with the NREN, and with users of other countries. CANARIE's NREN Program provides funding for RANs to increase the capacity and reliability of existing equipment and infrastructure; to enable network management (tools and training); and to extend the reach of RAN networks to more institutions.

Execution of projects funded under Call 3

CANARIE continues to review the development of the nine projects funded under Call 3. Five (5) of these projects were completed in 2018-19.

Technical and financial audits of projects funded under Calls 1, 2 and 3

Audits have been completed for 10 of the 15 projects to be audited; another 3 are in progress.

Increased reliability and capacity on network segments shared by RANs

CANARIE collaborated with ORION (Ontario) and RISQ (Quebec) to share network services along the Toronto, Ottawa, and Montreal corridors. ORION and RISQ supplied network services to CANARIE over their network systems, augmenting the CANARIE network through physically diverse paths. These diverse network paths improve the reliability and redundancy of the CANARIE network significantly.

Strategic alignment of NREN partners on the evolution of the NREN and the development and launch of projects to enhance security

CANARIE continues to collaborate with provincial and territorial network partners to evolve Canada's National Research and Education Network (NREN). The strategic plan focuses on NREN Services, Organization and Relationships, and how the NREN can improve and expand in these areas to deliver maximum value to Canada's research and education community. It is important to note that this is the first strategic plan ever developed for the NREN, and is a testament to the commitment of the members of the NREN Governance Committee, who come from 13 organizations with different mandates, governance structures and funding models.

These representatives are committed to the execution of the elements of the strategic plan and to devoting the necessary resources to continue to strengthen the NREN, including the first ever national procurement for the NREN. The procurement will see the purchase and deployment of the same Security Information and Event Management tool across all thirteen partners in the Canadian NREN, and the hiring of security analysts in each organization, in order to create a

national NREN security community. The procurement was finalized in 2018-19, and deployment is expected in 2019-20.

Other Achievements – NREN

NREN Assembly

CANARIE facilitated the first ever NREN Assembly in Ottawa in August 2018, bringing together staff from across the NREN. The event provided an opportunity for NREN staff to learn more about what is taking place across the entirety of the NREN, to meet NREN colleagues face to face, and to develop operational priorities for the coming year. Based on the success of the Assembly, it is now planned as an annual event.

Network Services - Canadian Access Federation:

Overview of Strategy for Network Services

CANARIE works with stakeholder groups to identify demand for network services and collaborates with national and global partners to deliver them. Currently, CANARIE is the national operator of the Canadian Access Federation (CAF), which enables Canadian students, staff and faculty to access protected online content using their existing institutional credentials (i.e. home username and password) through its Federated Identity Management (FIM) service. Institutions participating in CAF also benefit from the *eduroam* service, which provides students, staff and faculty with secure access to the Wi-Fi network on the campus they are visiting, by using their home institution's credentials.

Increased adoption of CAF services

In 2018-19, participation in the Canadian Access Federation increased from 157 to 167 organizations. Participants continue to benefit from the *eduroam* service: more than half a million users were able to seamlessly log on to campus Wi-Fi networks in Canada and around the world using their home institution's credentials. In 2018-19, CANARIE supported over 276 million *eduroam* inter-institutional logins.

As identity management is crucial to security and asset management in a connected world, CANARIE continues to present the benefits of CAF at events, and has developed and published case studies highlighting identity management success stories.

Other Achievements – CAF:

eduroam Visitor access (eVa) Pilot

In 2018-19, CANARIE successfully piloted *eduroam* Visitor access (eVa), a service to provide secure guest access to institutions' Wi-Fi networks via *eduroam*, at four institutions. This service will roll out to interested institutions in 2019-20.

The first week back at school in September 2018 saw nearly 6.3M inter-institutional logins to eduroam, a 24% increase from the previous year

Updated fee structure

As a result of the growth in the use of CAF services since their introduction in 2012, CANARIE undertook a review of the CAF participant fee structure. The outcome of the review was an updated pricing and tier structure that increased participation fees for larger institutions, reflecting their heavier use of the services, while maintaining affordability for smaller institutions, some of which saw no price increase. Since

2012, CANARIE's financial contribution to the program had grown from 31% to 46%, the new structure reduces CANARIE's contribution to a projected 38%.

2. Technology Innovation:

Research Software Program:

Overview of Strategy For Research Platform Infrastructure (Research Software Program)

In order to address gaps in research infrastructure and leverage existing investments in research software, CANARIE will support the creation of technologies to bring new collaboration capabilities, not previously offered, to the research community. CANARIE will leverage previous investments in technology innovation projects and further evolve research software tools to enable increased access to data and tools and to accelerate research outcomes.

Maintain visits to science.canarie.ca consistent with FY18 levels

CANARIE continues to maintain and promote the software portal at science.canarie.ca in order to encourage the reuse of existing research software tools.

Contracts in place and execution underway for all approved Call 2b platform contribution projects

Contracts are in place for all projects funded under Call 2b, and execution has begun.

Execution of projects funded under Call 2a

CANARIE continues to review the development of the five projects funded under the 2017 call (Call 2a).

Financial audits of projects funded under Call 1

Financial audits of all six (6) projects funded under Call 1 took place in 2018-19.

Other achievements – Research Software

Research Software Outreach

CANARIE hosted the inaugural Canadian Research Software Conference in May 2018; the event built upon the previous success of the Research Software Workshop, and is set to become an annual event. Additionally, the second annual survey of academic research software developers in Canada was conducted in September 2018.

Internationally, CANARIE participated as a member of the steering committee for the newly formed Research Software Alliance (ReSA) and in Research Software Leadership meetings.

Reusable Platform

CANARIE began work on the deployment of a Reusable Platform, in order to assist Canadian researchers to get the software they need to support their research as efficiently as possible.

Local Support Pilot

The Local Support pilot funds local software development teams in two institutions to provide on-campus support for research software tools. This pilot is intended to demonstrate that further reduction of software duplication and accelerated discovery is possible by providing training for researchers, training for software developers, cataloguing pre-existing software available at an

institution, recommending the re-use of existing software, and fostering a culture of software sustainability.

Research Data Management:

Overview of Strategy for Research Data Management

In response to consistent community feedback that identified the need to coordinate activities in research data management, CANARIE took action and provided funding to support Research Data Canada (RDC) in 2014. RDC's overarching goal is to improve the management of research data in Canada so that it is broadly available to support knowledge creation and innovation. CANARIE was given the mandate to support RDC in its 2015 Contribution Agreement, and an Executive Director was hired in 2016.

Members of the community presented the need for the development of software tools to bridge gaps in the Research Data Management ecosystem. As a result, CANARIE launched a Research Data Management (RDM) program in 2017-18. The program used a two-step approach: a community consultation to identify priority areas for tool development, followed by a planned call for proposals to develop the highest priority tools.

Contracts in place and execution underway for all approved projects of the competitive call

Contracts are in place for all nine (9) projects funded under the competitive call, and execution has begun.

Other achievements – Research Data Management

Community coordination and national engagement activities

RDC continues to host, facilitate, and participate, in a number of activities to support Canada's research data community. Most notably, in January 2019, RDC brought together a broad stakeholder community to discuss the opportunities and challenges of building a National Data Services Framework (NDSF) in Canada.

Key outcomes of these meetings included a stakeholder statement called the Kanata Declaration¹, the development of an Research Data Management roadmap for Innovation, Science, and Economic Development (ISED) Canada, and the establishment of a Working Group to discuss a national approach to RDM training.

3. Private Sector Innovation

CANARIE seeks opportunities to leverage digital infrastructure and tools to maximize the use of transformative technologies and drive increased innovation and commercialization. CANARIE currently participates in two major initiatives to support ICT sector innovation and commercialization.

¹ Available at <https://zenodo.org/record/3234815#.XPke5YhKiUk>

DAIR Program:

Overview of Strategy For DAIR

In order to leverage CANARIE resources to stimulate commercialization, CANARIE delivers a cloud-based program, the Digital Accelerator for Innovation and Research (DAIR), that enables advanced ICT research and provides an opportunity for entrepreneurs to accelerate time-to-market. DAIR offers powerful cloud computing resources to small and medium-sized enterprises (SMEs) to accelerate their product development timelines and enable faster time to market. DAIR exposes users to the power of cloud technologies to transform traditional business models and provides these businesses with an opportunity to adopt these technologies as part of their long-term growth strategy.

Continued increase in the total number of DAIR users to 1211 by the end of FY19 based on the FY18 projection of 1053

The aggregate number of DAIR users as of April 1, 2019 was 1232, which is up from 1080 from the prior year. This is ahead of the FY19 target of 1211 aggregate users.

New features added to the DAIR cloud infrastructure

In order to ensure DAIR services are current and respond to ever-evolving user needs, CANARIE continued to invest in updates to the DAIR infrastructure. In 2018-19, new features included support for Docker containers, with a companion technical guide providing instructions on how to deploy containerized applications to the DAIR cloud. CANARIE also completed upgrades to the OpenStack private cloud to improve networking capabilities, and to enhance the management console and overall performance.

Ilya Pavlovski, Director of Technology for Green Power Labs, says DAIR "allowed us to experiment and build our proof of concept prototype to attract investors before looking to scale with a commercial cloud. And the price was right!"

Content released to educate SMEs on efficient use of cloud services

CANARIE developed a range of marketing material to educate users on the most efficient use of cloud services, and to demonstrate how users are realizing competitive benefits through their use of DAIR. CANARIE has developed and presented a comprehensive overview of cloud services and continued to present this through the Fundica Roadshow, which targets early-stage Canadian companies, and community engagement at other local events such as Docker Meetups, IoT613 conference, and Impact AI conference in Ottawa.

In 2018-19, a new YouTube video to educate SMEs, entitled 'Docker Primer', was developed to show how simple it can be to deploy containers to DAIR.

Other achievements – DAIR

DAIR Evolution

CANARIE continues to advance the DAIR platform, in order to provide the most value to Canada's SME community. In 2018-19, CANARIE began work on a pilot whose objective is to allow Canadian SMEs to quickly integrate new technologies, such as machine learning, into their businesses and product offerings, and to leverage the ongoing investments made by the private sector in Canadian cloud data-centres. The pilot will launch in 2019-20.

Centre of Excellence in Next Generation Networks (CENGN):

Overview of Strategy For CENGN

CANARIE is a founding partner in the Centre of Excellence in Next Generation Networks (CENGN), which is a consortium of industry (including: Juniper, Cisco, Nokia EXFO, TELUS), academic, and research leaders who are pooling their expertise and equipment to lower the barrier to market entry for SMEs and researchers.

CENGN was awarded funding by the Networks of Centres of Excellence program in 2014 and created the governance structure and technical and staff infrastructure to take on projects beginning in mid-2015.

Additional participants in CENGN will be able to leverage the CANARIE network to support advanced testing and demonstration of new ICT products and services

CANARIE continues to play a key role in this initiative as CANARIE network resources are made available to support test-bed infrastructure for new product validation and testing.

3.0 Statement of Eligible Activities for 2019-20 and for the Foreseeable Future

In 2019-20, CANARIE will continue to align its activities towards the goal of strengthening Canada's digital research infrastructure. In 2019-20, CANARIE plans to continue its focus on its three eligible activities.

1. Network Evolution:

CANARIE Network:

Deployment of additional network capacity to meet the growing traffic need

CANARIE will continue to improve the capacity, redundancy and resiliency of the CANARIE network, in order to meet the needs of Canada's research, education, and innovation communities.

Deployment of additional network capacity to support Northern connectivity

CANARIE will improve the capacity, redundancy and resiliency of the CANARIE network in Northern Canada, in order to meet the needs of Canada's research, education, and innovation communities in these regions.

Improved core node reliability

CANARIE will continue to explore opportunities to improve redundancy of the core network and connections to RANs.

Improvement of network security monitoring and measurement system

CANARIE will continue to work with the RANs on the NREN SIEM Deployment Project, to improve the security of both the CANARIE Network and the NREN, and to create a community of NREN security analysts across the country. These projects are expected to be completed in 2019-20.

Deployment of the Software Networking Pilot

CANARIE will continue to explore opportunities and technologies to deploy Network Automation tools for streamlining the network operational processes and improving alert notifications.

Deployment of support tools accessible through the user portal

CANARIE continues to develop features for the network support portal, in order to improve support for users.

Execution of a Call for Participation in the Joint Security Project

CANARIE will launch a Call for Participation to expand the Joint Security Project beyond the initial pilot project group of institutions.

Other initiatives – Network

Cloud Services

CANARIE continues to work with a number of government and private sector partners to discuss how to best take advantage of recent private sector investments in cloud technologies (data centres) in Canada. Cloud technologies provide users with significant scale and agility benefits as users it allows them to increase or decrease their use of these resources based on their needs at any given point in time, without having to make significant capital investments in equipment.

NREN CEO Forum

CANARIE's President and CEO continues to actively participate in the NREN CEO Forum, and this international group will next convene in July 2019 and February 2020.

NREN Program:

Execution of the NREN SIEM Deployment Project

CANARIE will continue to work with the RANs and the SIEM analysts on the NREN SIEM Deployment Project, to improve the security of both the CANARIE Network and the NREN. The formal launch of this initiative is expected to be completed in 2019-20 after which it will become fully operationalized.

Execution of projects funded under Call 3

Execution will continue for all approved NREN Call 3 projects.

Technical and financial audits of funded projects under Calls 1, 2 and 3

CANARIE will complete the 5 outstanding audits, of the 15 that were planned.

Increased reliability and capacity on network segments shared by RANs

\$5.98M of CANARIE funding has been committed to NREN projects since the beginning of the mandate. Funding from both the Non-Directed funding and the Interconnection and Co-delivery components of the NREN Program continues to support increased reliability and capacity on network segments shared by RANs.

Strategic alignment of NREN partners on the evolution of the NREN and the development and launch of projects to enhance security

Activities in support of the NREN strategic plan continue under the guidance of the NREN Governance Committee and work has been undertaken on key elements of the plan. NREN

Governance Committee members are executive sponsors for key deliverables identified in the plan, and work is progressing on those specific elements.

Network Services – Canadian Access Federation:

Increased adoption of CAF services. CAF is projected to grow to 184 participants by the end of FY20 based on the FY19 projected count of 168

CANARIE will continue to promote the benefits of the Canadian Access Federation – both *eduroam* and Federated Identity Management – to the research and education community. To this end, CANARIE will continue to investigate opportunities to extend the reach and expand the benefit of the CAF identity services, including with the private sector. In FY20, CANARIE will launch, after a successful pilot, *eduroam* Visitor access (eVa), to provide secure guest access to institutions' Wi-Fi networks.

2. Technology Innovation

Research Software Program:

Maintain visits to science.canarie.ca consistent with FY19 levels

Science.canarie.ca is the online repository of reusable software tools that have been funded by CANARIE and that are available to all researchers. CANARIE will continue to promote the repository to the research software developer community in Canada.

Develop metrics and best practices for the Local Support Initiative and the Reusable Platform Initiative

CANARIE will develop best practices and metrics for the two pilot initiatives launched during FY19. In addition, knowledge gained through the Reusable Platform Initiative will be transferred to the software development teams funded under the Local Support Initiative.

Execution of the development and maintenance portions of projects funded under Call 2a and 2b

CANARIE will continue execution for all approved Call 2a and Call 2b platform contribution projects. Funding for each project remains dependent on the addition of at least one new research team.

Research Software Outreach

A second Canadian Research Software Conference will be hosted by CANARIE in May 2019; the third annual survey of academic research software developers in Canada will be held in September 2019. CANARIE will also continue its participation in various international research software initiatives.

Through consultation with the Canadian research software community, CANARIE will undertake development of roadmaps, from technical and research perspectives, for research software in Canada going forward.

Financial audits of funded projects

CANARIE will carry out all necessary financial audits of by the end of 2020-21.

Research Data Management Program:

Execution underway for all Research Data Management funded projects

CANARIE will continue execution for all approved projects.

Development of an action plan for Canada's National Data Services Framework

RDC will continue to facilitate discussions of best practices and national data services via additional NDSF Summits and associated stakeholder meetings.

Host data management workshops with the heads of research in the university and college communities

In 2018-19, RDC hosted a series of daylong RDM workshops, including a workshop for Vice Presidents Research from Colleges, Institutes and Polytechnics; and workshops for the broad stakeholder community via the NDSF Summit. In 2019-20, RDC will continue these efforts.

Financial audits of funded projects

CANARIE will carry out all necessary financial audits of by the end of 2020-21.

Execution of targeted proposal to advance research data management priorities

CANARIE will select and execute on approved projects.

3. Private Sector Innovation:

DAIR Program:

Continued increase in the total number of DAIR users to 1300 by the end of FY20

CANARIE will continue to accept applicants and to promote the DAIR program, and the benefits of cloud computing, to Canadian SMEs.

New features added to the DAIR cloud infrastructure

CANARIE will invest and make available current generation GPUs which are in high demand due to interest in adoption of machine learning applications. In addition to GPUs, CANARIE will provide access to the latest cloud services offered by leading Canadian commercial cloud providers in order to further accelerate development and commercialization of new cloud based businesses. The pilot will encompass both public and private clouds and make them available to DAIR participants through a unified user interface known as a cloud broker.

Content released to educate SMEs on efficient use of cloud services

CANARIE will continue to develop training materials to assist SMEs in maximizing the utility of cloud technologies.

Introduction of BoosterPacks (sample code and documentation)

As part of the DAIR evolution pilot, CANARIE will fund four Canadian SMEs to develop 'Booster Packs,' which provide the reference code, documentation and "tips and tricks" that enable other Canadian SMEs to learn about and evaluate emerging cloud technologies for potential fit within their own business model.

Piloting the use of commercial cloud, combined with the existing DAIR private cloud, in providing extensible advanced cloud-based capabilities to SMEs for development of future products and services

As part of the DAIR evolution pilot, CANARIE will test the cost and benefits of SMEs utilizing 'BoosterPacks' to speed their learning and technology adoption capabilities, and provide SMEs with visibility into actual costs of cloud services, based on their use, by operating within a commercial cloud environment.

Centre of Excellence in Next Generation Networks (CENGN):

Additional participants in CENGN will be able to leverage the CANARIE network to support advanced testing and demonstration of new ICT products and services

There continues to be a robust pipeline of new projects at CENGN that will likely leverage the CANARIE network. CANARIE continues to work with partners at CENGN to evolve the infrastructure to develop an enhanced level of capability.

CANARIE also continues to participate in a number of discussions with public and private sector stakeholders wishing to gain CANARIE's support for new network test-bed initiatives. This interest indicates the critical role of advanced networking in supporting a range of strategic technology research and development projects. CANARIE will continue to work with its stakeholder partners and the Government of Canada to ensure that its powerful network infrastructure is leveraged to support Canadian competitiveness in advanced technologies.

Over the next year, CANARIE will ensure that all activities that have been implemented to achieve these three eligible activities will be successfully completed, in line with the terms and conditions of CANARIE's Contribution Agreement.

4.0 Statement of CANARIE's Investment Policies, Standards, and Procedures

CANARIE's investment strategy is specifically tailored to the duration and quality constraints in terms of investment options imposed by the Statement of Investment Policy and the Contribution Agreement with Innovation, Science and Economic Development Canada. These constraints, while deemed appropriate and necessary to meet the overall objectives of CANARIE, preclude a more active approach to investment management.

Rather than active investment management, the strategy adopted by CANARIE is "buy and hold", based on the following framework:

- Investment maturities will, wherever possible, match the forecasted cash requirements of CANARIE.
- The quantitative limits on investment holdings provide ample structural liquidity to meet the needs of CANARIE. It is appropriate, therefore, to hold less liquid types of approved investments. Value added will be achieved by moving out the "liquidity curve" when possible.
- At all times, CANARIE will hold investments deemed eligible under the Statement of Investment Policy (see Appendix 1). For greater clarity, the determination of eligibility shall be made at the time of purchase. CANARIE will not be obliged to dispose of investments which become ineligible after the date of purchase, but will favour (subject to market conditions) disposing of such securities should assets need to be liquidated. (Refer to the Liquidity policy (s.7) in the Statement of Investment Policy.)

Within this context, CANARIE's official Statement of Investment Policy as adopted by the Board of Directors, and reviewed and approved in the year by the Audit & Investment Committee of the Board, is contained in Appendix 1.

5.0 Statement of Compensation

Directors on CANARIE's Board, including officer positions such as Chair, Vice-Chair and Secretary/Treasurer, receive no compensation beyond reimbursement for any reasonable out-of-pocket expenses incurred while performing their duties or attending CANARIE meetings.

The President and CEO of the organization has a compensation package that is benchmarked regularly against external comparatives by an external consultant and overseen by the HR (Executive) Committee of the Board. All other staff positions at CANARIE are classified according to a structured system that assigns a salary range to each position. The system and staff salaries are regularly benchmarked against comparative organizations by an external consultant.

For the fiscal year ending March 31, 2019, salary ranges for all officers and employees of CANARIE whose total compensation remuneration paid exceeded \$100,000 (including any fee, allowance or other benefit) are presented below.

Officers

President and CEO
\$326,000 - \$424,000

Chief Financial Officer
Chief Technology Officer
Vice-President, Business Development
Vice-President, External Relations
\$179,000 - \$296,000

Employees

Chief Engineer
Director, Finance
Director, Research Software
Executive Director, Research Data Canada
NREN Coordination Manager
Senior Director, Technology Innovation
\$141,000 - \$236,000

Director, Communications
Manager, Cybersecurity
Senior Network Engineer
\$111,900 - \$181,000

Finance Manager
IT Manager
Manager, Analytics
Manager, Strategic Policy

Manager, Software Development
 Program Manager, Canadian Access Federation
 Network Engineer
 Software Developers
 Technology Architect, Canadian Access Federation
 \$100,000 - \$143,000

6.0 List of Eligible Projects, the Funding Provided Detailed by Expenditure Type, and a Description of Progress Achieved to Date

6.1 National Research and Education Network Program (NREN)

The NREN program continues to support the advancement of Canada's National Research and Education Network (NREN). The program's key objective is to strengthen the impact of Canada's co-delivery model and enable aligned strategic evolution of the NREN based on national priorities. Program objectives are achieved through a variety of initiatives:

- Non-Directed, competitive funding enables provincial/territorial network partners to upgrade network infrastructure and extend provincial network connections;
- Directed funding ensures that the National Research and Education Network evolves in a consistent, coherent and strategic manner;
- Interconnection and Co-delivery funding ensures that provincial and territorial partners support co-delivery of the NREN and comply with the requirements of CANARIE's Interconnection Agreement; and
- Operating and Strengthening the NREN promotes the impact of Canada's co-delivery model.

In 2018-19, \$220,000 was paid to the RAN partners in funding for Interconnection and Co-delivery.

Table 6.1 details the RAN partners that utilized Non-Directed NREN funds in the first four years of the mandate.

Table 6.1 NREN Program – Non-Directed Funding (\$ 000s)

RAN Partner	Project Commitment	Funding				Total
		2015-16	2016-17	2017-18	2018-19	
RISQ	1,431	-	456	367	600	1,423
MRnet	1,045	-	108	-	826	934
BCNET	1,026	-	225	748	-	973
SRNET	825	-	184	500	104	788
ORION	539	-	539	-	-	539
NB	489	-	348	14	-	362
Cybera	466	109	89	120	63	381
ACORN-NL	160	-	-	-	77	77
Total	5,981	109	1,949	1,749	1,670	5,477

Table 6.1a details the RAN partners that utilized Directed NREN funds for the SIEM Staffing Project.

Table 6.1a NREN Program – Directed Funding – SIEM Staffing (\$ 000s)

RAN Partner	Project Commitment	Funding	
		2018-19	Total
UNB	203	64	64
BCNET	175	51	51
ACORN-NS	148	31	31
Cybera	120	10	10
Total	646	156	156

Table 6.1b details the commitments of Directed NREN funds to RAN partners for the SIEM Solution Project.

Table 6.1b NREN Program – Directed Funding – SIEM Solutions (\$ 000s)

RAN Partner	Project Commitment	Funding	
		2018-19	Total
ACORN-NL	157	-	-
MRnet	85	-	-
Total	242	-	-

6.2 Joint Security Project

The Joint Security Project strengthens the overall security of NREN-connected institutions in the short term, and helps better understand potential vulnerabilities, by facilitating the development of a community of institutional security specialists to increase institutional awareness of security issues. CANARIE launched a call for proposals for institutions to deploy their existing security aggregation and visualization platform to meet the needs of the Joint Security Project.

Table 6.2 details the platforms that were approved for funding under that call.

Joint Security Project costs were funded through an HST refund of \$817,821 received in 2015. Costs in excess of this amount were funded through ISED.

Table 6.2 Joint Security Project (\$ 000s)

Lead Contractor	Project Commitment	Funding		
		2017-18	2018-19	Total
University of Waterloo	113	113	-	113
Concordia University	103	103	-	103
McMaster University	85	49	36	85
Total	301	265	36	301

6.3 Research Software Program

The Research Software Program leverages the services developed under previous mandates to drive collaborative development of reusable software services and adaptation of existing research platforms for use across multiple research domains, providing researchers with the tools required to accelerate research.

The Research Software Program launched its first funding call of the current mandate in 2015-16. Table 6.3 details the projects that were approved for funding under that call.

Table 6.3 Research Software Program – Call 1 (\$ 000s)

Lead Contractor	Project Commitment	Funding			Total
		2016-17	2017-18	2018-19	
CRIM	600	325	275	-	600
Ocean Networks Canada	577	204	251	37	492
Bird Studies Canada	558	209	282	36	527
Ouranos	493	139	355	-	493
University of Calgary	376	149	225	(5)	369
University of Guelph	92	53	39	(8)	84
Total	2,696	1,079	1,427	60	2,566

The Research Software Program launched its second funding call of the current mandate in 2017-18. Table 6.3a details the projects that were approved for funding under that call.

Table 6.3a Research Software Program – Call 2a (\$ 000s)

Lead Contractor	Project Commitment	Funding		Total
		2017-18	2018-19	
University of British Columbia	488	176	142	317
University of Guelph	456	139	160	299
University of Waterloo	440	106	91	197
Queen's University	430	133	92	226
University of Waterloo	292	76	105	180
Total	2,106	630	590	1,220

The Research Software Program launched its third funding call of the current mandate in 2018-19. Table 6.3b details the projects that were approved for funding under that call.

Table 6.3b Research Software Program – Call 2b (\$ 000s)

Lead Contractor	Project Commitment	Funding	
		2018-19	Total
University of Guelph	225	75	75
University of Waterloo	225	77	77
McMaster University	225	15	15

CRIM	225	81	81
Simon Fraser University	225	28	28
Université de Sherbrooke	225	76	76
Concordia University	224	60	60
Ocean Networks Canada	224	54	54
École de technologie supérieure	222	73	73
McGill University	222	65	65
University of Victoria	221	72	72
McGill University	221	72	72
Simon Fraser University	221	69	69
SensorUp Inc	220	71	71
Université de Sherbrooke	220	64	64
Bird Studies Canada	219	64	64
University of Calgary	218	47	47
Queens University	217	59	59
Ocean Networks Canada	211	86	86
University of Calgary	208	85	85
Total	4,418	1,296	1,296

The Research Software Program launched its first local software support call of the current mandate in 2018-19. Table 6.3c details the projects that were approved for funding under that call.

Table 6.3c Research Software Program – Local software support call 1 (\$ 000s)

Lead Contractor	Project Commitment	Funding	
		2018-19	Total
McMaster University	453	85	85
Carleton University	448	-	-
University of Regina	335	-	-
Total	1,236	85	85

6.4 Research Data Management

The Research Data Management Program continues to support and enable national initiatives that advance the appropriate management of research data across Canadian sectors, fueling new discoveries and business opportunities.

The Research Data Management Program launched its first funding call of the current mandate in 2018-19. Table 6.4 details the projects that were approved for funding under that call.

Table 6.4 Research Data Management – Call 1 (\$ 000s)

Lead Contractor	Project Commitment	Funding	
		2018-19	Total
University of Saskatchewan	553	134	134

Ontario Brain Institute	485	155	155
McGill University	381	85	85
University of Toronto	358	103	103
University of Toronto Library	354	73	73
University of British Columbia - Library	346	28	28
University of Prince Edward Island	242	24	24
Ocean Networks Canada	226	23	23
CRIM	209	80	80
Total	3,154	705	705

6.5 Digital Accelerator for Innovation and Research (DAIR) Program

DAIR is an integrated virtual environment that leverages the CANARIE network to enable SMEs to develop and test new ICT and other digital technologies. It combines advanced networking, cloud computing, and storage resources to create an environment to develop and test innovative ICT applications, protocols, and services; perform at-scale experimentation for deployment; and facilitate a faster time to market.

During the first year of this mandate, CANARIE committed \$1.5M in funding to partners to manage the DAIR resources and ensure their availability and maintenance for the 2015 – 2020 mandate. In 2018-19, this commitment has been amended and decreased by \$.07M.

Table 6.5 Digital Accelerator for Innovation and Research (DAIR) Program (\$ 000s)

Lead Contractor	Project Commitment	Funding				Total
		2015-16	2016-17	2017-18	2018-19	
Cybera	1,476	133	357	349	288	1,127
Total	1,476	133	357	349	288	1,127

In 2018-19, CANARIE committed \$130,412 to the evolution of the existing DAIR program by investing in new generation GPUs.

Table 6.5a GPU pilot for Innovation and Research (DAIR) Program (\$ 000s)

Lead Contractor	Project Commitment	Funding	
		2018-19	Total
Cybera	130	109	109
Total	130	109	109

7.0 Criteria Applied to Select Eligible Projects

The published criteria used to select the projects under the programs with active funding calls in 2018-19 are provided in Appendices 2-6.

8.0 Summary of the Results of Audits and Evaluations Carried Out During the Year

Financial Audit: CANARIE annually provides for a Financial Audit undertaken by independent auditors who are approved each year by CANARIE’s membership and overseen by the Audit and Investment Committee of the Board. The results of this Audit are provided to the Minister as part of each year’s Annual Report to the Minister. The Financial Audit for the 2018-19 Fiscal Year was completed in June 2019 by BDO Canada LLP, Chartered Professional Accountants.

Evaluation: In 2018-19, Innovation, Science, and Economic Development (ISED) Canada carried out an evaluation of CANARIE, which found that “[t]here is a demonstrated need for the federal government to continue supporting CANARIE in delivery of a national high speed network [...]”

Recipient Audits: In agreements with Eligible Ultimate Recipients for Eligible Projects, CANARIE is required to provide for the conduct of an audit of:

- (i) any Eligible Project where CANARIE’s contribution exceeds \$1M,
 - (ii) any Eligible Project where CANARIE deems that an audit is appropriate, and
 - (iii) a representative sample of projects to which CANARIE has contributed less than \$1M,
- according to the terms and procedures set out in the Performance and Risk Framework and the Contribution Agreement.

CANARIE includes in its contracts with Eligible Ultimate Recipients a requirement for the conduct of an audit by an auditor selected by CANARIE for all funded projects, regardless of the amount of CANARIE funding received. This provides CANARIE with the ability to audit projects where warranted or deemed appropriate, and to perform representative sample audits.

CANARIE selected two audit firms to manage the recipient audits subsequent to an RFP that was issued for that purpose. The firms audited the projects where funding was provided during the current mandate, according to an audit plan that was developed to meet the requirements of the Contribution Agreement, and the Performance and Risk Framework developed for the current mandate. The following table reflects the audits performed in fiscal 2018-19.

Table 8.1 Recipient Audits performed in 2018-19

Program	Lead Contractor	Project
NREN	BCNET	Coquitlam and Westminster R&E Fibre Network
NREN	BCNET	Surrey Innovation Boulevard
NREN	BCNET	Vancouver 100G WDM
NREN	Cybera	Edmonton Urban Fibre Connectivity
NREN	Cybera	Edmonton Urban Fibre Connectivity – NorQuest College
NREN	Cybera	Edmonton Urban Fibre Connectivity – Concordia University of Edmonton
NREN	SRNET	BH Telecom Dark Fibre Tail Circuits
NREN	MRnet	Churchill Wavelength
NREN	ORION	York Region Infrastructure
NREN	ORION	Kingston Region Infrastructure
NREN	RISQ	Replacement Infrastructure SONET

NREN	UNB	NB Shared Router Deployment
NREN	ACORN-NL	ACORN-NL Renewal Project
Research Software	Bird Studies	Motus Wild Life Tracking System
Research Software	CRIM	Adnotare
Research Software	Ocean Networks	User-Defined Oceanographic Data Products
Research Software	Ouranos	PAVICS
Research Software	University of Calgary	Cloud UAV: A Network Enabled Platform for Unmanned Aerial Vehicles
Research Software	University of Guelph	CWRC – Writer Software Service
Joint Security	Concordia University	CANARIE Security Information Exchange
Joint Security	McMaster University	CanIDS
Joint Security	University of Waterloo	Hadoop and Jupyter

Appendix 1: Statement of Investment Policy

Statement of Investment Policy

Purpose

The purpose of this document is to establish an investment policy best suited to meet the needs and objectives of CANARIE's investment portfolio. This document is specifically intended to meet the requirements of ss 4.3, 4.4, 4.7, 4.8, 4.9, 4.10, and 4.11 of the Contribution Agreement between CANARIE Inc. and Her Majesty in Right of Canada dated October 9th, 2015.

All aspects of this Policy are governed by the Prudent Person Principle (refer to s 4.1 of the Contribution Agreement) and the principal objective of investment decisions shall be the preservation of capital to meet future disbursement requirements.

Investment Policy

(1) Long-term return objectives and expectations:

The long term objectives of the portfolio are twofold: (a) to provide funds on an "as needed" basis to meet the disbursement needs of CANARIE and (b) to maximize the investment income earned by CANARIE, subject to the Investment Strategy and Investment Policy adopted by CANARIE.

(2) Ratings of Securities:

The deemed rating (the "Rating") of any Eligible Security will be established, at the time of CANARIE's acquisition of the Eligible Security.

Reference to the "issuer" shall include the unconditional guarantor, if applicable.

The rating category for Investment Policy purposes shall be based on the ratings of at least two of the following four rating agencies: Dominion Bond Rating Service (DBRS), Standard and Poors (S&P) Rating Services, Moody's Investors Service and Fitch Rating Ltd.

In the case of Commercial Paper and other short-term investments:

To be included in the AAA category, the security must have at least two of the following, where two are available:

- (i) R-1 (high) from DBRS
- (ii) A-1+ from S&P and the issuer's bonds are rated "AAA" by S&P
- (iii) P-1 from Moody's and the issuer's bonds are rated Aaa by Moody's
- (iv) F-1+ from Fitch and the issuer's bonds are rated AAA by Fitch

To be included in the AA category, the security must have at least two of the following, where two are available:

- (i) R-1 (middle) from DBRS
- (ii) A-1+ from S&P
- (iii) F-1+ from Fitch
- (iv) P-1 from Moody's and the issuer's bonds are rated Aa by Moody's

In the case of bonds and other longer term investments:

To be included in the AAA category, the security must have at least two of the following:

- (i) AAA from DBRS
- (ii) AAA from S&P
- (iii) AAA from Moody's
- (iv) AAA from Fitch

To be included in the AA category, the security must have at least two of the following:

- (i) AA from DBRS
- (ii) AA from S&P
- (iii) Aa from Moody's
- (iv) AA from Fitch

(3) Diversification policy of the investment portfolio, including quantitative limits on investments:

Throughout the life of CANARIE's portfolio, CANARIE's investments in the securities of **any one issuer (or two or more affiliated entities)** will be limited to an aggregate market value limit based on the Rating of the security:

Rating Security	<u>AA</u>	<u>AAA</u>
Government Securities	no limit	no limit
Provincial / Municipal Financing Authority	10% of portfolio	10% of portfolio
Municipal Securities	10% of portfolio	10% of portfolio
Other Eligible Securities	10% of portfolio	10% of portfolio

Throughout the life of CANARIE's portfolio, CANARIE's investment in the securities of **any one category** will be limited to an aggregate market value limit of the category, as set out below:

Rating Security	<u>AA</u>	<u>AAA</u>
Government Securities*	30% of portfolio (minimum Government Securities is 10% of the portfolio)	no limit
Provincial / Municipal Financing Authority	70% of portfolio **	same 70%
Municipal Securities	70% of portfolio**	same 70%
Other Eligible Securities	70% of portfolio**	80% of portfolio

* For greater certainty, the phrase "Government Securities" means all securities issued, guaranteed by, or that have the full faith and credit of the federal government or a provincial government.

** The 70% constraint applies to the aggregate of AA securities.

(4) Asset allocation strategy:

The portfolio will, at all times, be invested in Eligible Securities (refer to (5) below).

(5) Permitted investment instruments and trading activities:

CANARIE shall invest in Eligible Securities. Eligible Securities are defined as: bank certificates of deposit; banker's acceptances; treasury bills, commercial paper and other short-term securities, bonds and notes issued by the federal government, provincial governments, municipal governments and corporations; cash deposits in banks identified in Schedule I of the *Bank Act*; guaranteed investment certificates; and other fixed-income securities that carry the full faith and credit of the Government of Canada. For greater certainty, CANARIE shall not invest in derivatives, swaps, options or futures.

Any securities acquired shall have a Rating of at least AA.

All securities will be denominated in Canadian dollars.

The Investment Advisors/Managers, will have authorized power to recommend and execute all trades on behalf of CANARIE Inc. The Investment Advisors/Managers will notify CANARIE Inc. and include all details of all confirmations of trades.

The Board's Audit and Investment Committee will be advised of the transaction details by email or facsimile the same week that the transactions are authorized, or as soon as practical thereafter.

(6) Prohibited investment instruments and trading activities:

Prohibited investments consist of all investments not defined as permitted investment instruments.

(7) Liquidity policy:

- (a) The maturities and terms of investments shall match the profile of CANARIE's forecasted disbursements. In cases where the timing of disbursements is unknown, investments shall be held in securities with term to maturity of one year or less.
- (b) Should an unexpected disbursement or series of disbursements made by CANARIE reduce the total market value of the portfolio, CANARIE shall immediately take the steps necessary to comply with the requirements set by the diversification policy (refer to (3) above) within a period of 60 days from the date as of which CANARIE first failed to meet those requirements. Under no circumstances shall CANARIE materially fail to comply with the diversification requirements of section 3 for a period of more than 90 consecutive days.

(8) Risk management policies:

The purpose of CANARIE's investment portfolio is to earn investment income until such funds are needed to finance CANARIE objectives. The principal risks therefore are liquidity and capital preservation. Both risks, and steps taken to manage such risks, are specifically addressed in CANARIE's Statement of Investment Policy and Statement of Investment Strategy. In addition to the constraints contained in these documents, certain processes are in place to further manage these risks:

- On a monthly basis the Investment Advisor/Manager receives reports from CANARIE management regarding upcoming short term cash requirements. This is compared to the upcoming maturity schedule with corrective action, if any, being initiated.
- On an annual basis the Investment Advisor/Manager receives a long term projection of CANARIE liquidity requirements. This is compared to the long term maturity schedule. Based on the comparison of the two, corrective action, if any, is taken. Note that corrective action in this instance may be taken over an extended time period.
- On a quarterly basis the Investment Advisor/Manager reviews the credit ratings of all holdings. This is intended to act as an early warning as to potential, upcoming capital impairment issues.
- On a quarterly basis (or more frequently if necessary) the Investment Advisor/Manager reports to the Investment Committee on portfolio matters. Such matters include diversification compliance and potential capital impairment situations and recommended corrective actions.

(9) Policy on the lending of cash or securities:

The lending of cash or securities is not permitted.

(10) Performance measurement and monitoring procedures:

Performance is measured first by the prime objective of safety of investment and, secondly, by the ability of the investment portfolio to have funds on hand to meet all expenditure requirements. After those considerations in importance comes performance measurement. This will be addressed in ongoing fashion in reporting on new investments and reinvestments in terms of their yield relative to the Canada Curve (the yield that would be achieved from a benchmark Government of Canada bond of similar duration). Less attention will be paid to annual comparisons with other bond managers, unless they operate under similar constraints.

(11) Review:

This Statement of Investment Policy shall be reviewed at least once a year.

Appendix 2: NREN Program Criteria

Projects approved for funding under the NREN, Non-Directed Investment Calls will be selected through a competitive process. All project proposals will be reviewed relative to the mandatory criteria and the scoring criteria. Evaluation of proposals relative to these criteria will constitute the basis for the decision whether or not a project is to receive CANARIE funding. Projects that fail to meet the criteria, or fail to meet such criteria to an acceptable degree, cannot be funded.

These are the criteria against which proposals to the NREN Program will be evaluated:

Mandatory Criteria:

1. Projects must strengthen the NREN's ability to deliver consistent, high quality access to infrastructure and services for Canadians engaged in research, innovation and education;
2. Projects must lead to infrastructure or results that will be ongoing after CANARIE funding terminates;
3. Projects must demonstrate an ability to meet any ongoing operational costs resulting from the project without the use of CANARIE funding (e.g. through membership fee revenue);
4. Projects must result in an operational service (e.g. projects involving acquisition of fibre must also include the lighting of that fibre);
5. Tail circuit projects must demonstrate a minimum of matching funds in the form of cash contributions equivalent to 50% of the total project cost;
6. The project must be based on a viable funding model;
7. The applicants must be capable of undertaking the project;
8. The project must be technically sound and methodologically feasible; and
9. CANARIE funding must be necessary to deliver the results of the project or to ensure the timeliness of the delivery.

Scoring Criteria:

1. The advanced nature of the applications and services enabled by the project;
2. The extent of user demand and/or number of users impacted;
3. The cost effectiveness of the proposal, and the degree of financial and other contributions on the part of the RAN and other stakeholders;
4. The project's compatibility with, and contribution to, CANARIE's network and to its other objectives; and
5. Identification of project risks which may impact project timeline (e.g. the number and scope of RAN projects in progress, permits required for rights of way, etc.)

Should CANARIE receive more eligible proposals than the funding allocation can support, projects that have a higher financial leverage factor will be favoured.

Appendix 3: Research Software Program Criteria

Project proposals will be reviewed relative to the mandatory criteria and the scoring criteria. Evaluation of proposals relative to these criteria will constitute the basis for the decision whether or not a project is to receive CANARIE funding. Projects that fail to meet the mandatory criteria, or fail to meet evaluative criteria to an acceptable degree, cannot be funded.

These are the criteria against which proposals will be evaluated:

Mandatory criteria:

1. The existing platform must make use of Canadian digital infrastructure (networking, compute, storage and/or sensors).
2. The proposed project must contribute to one or more of CANARIE's expected results:
 - (a) enhance opportunities for collaborative knowledge creation and innovation within Canada's research and education communities through the maintenance and development of the CANARIE network and related tools and services;
 - (b) expand the research and education community's access to and utilization of the CANARIE network and the availability of tools and programming that increase the effectiveness of its use; and
 - (c) enable the creation of innovative Information and Communications Technology (ICT) products and services and accelerate their commercialization in Canada.
3. Software modification or integration must be technologically and economically viable within the timeline of the program.
4. All funded work must be performed in Canada.
5. The Lead Contractor must be a Canadian university, college, corporation or other legally recognized entity.
6. No more than half of the membership and Board of Directors of the Lead Contractor can be composed of representatives or agents of the federal government.
7. The cost of special purpose equipment MUST not exceed 5% of the total of all eligible project costs. The total cost of sub-contractors and consultants fees MUST not exceed 10% of the total of all eligible Project costs. In-kind contributions must be at least 15% of total eligible project costs.
8. Software developed with CANARIE funding must be made available for other researchers to use at no cost, through the CANARIE Research Software Registry at: <https://science.canarie.ca> for a period of 3 years from the end of the maintenance and support funding period.

Scoring Criteria:

1. Extent to which the platform will support new research applications;
2. Extent to which the project will advance Canada's capabilities in Research Software development;
3. Degree to which the project deliverables will advance research in Canada;
4. Extent to which the project makes use of existing software;
5. Completeness of the proposed project plan;
6. Costs to users such as license fees or hosting fees; and
7. The existing platform's compute and storage allocation strategy to support new research teams.

Appendix 4: Research Data Management Program Criteria

Project proposals will be reviewed relative to the mandatory criteria and the scoring criteria. Evaluation of proposals relative to these criteria will constitute the basis for the decision whether or not a project is to receive CANARIE funding. Projects that fail to meet the mandatory criteria, or fail to meet evaluative criteria to an acceptable degree, cannot be funded.

These are the criteria against which proposals will be evaluated:

Mandatory criteria:

1. The proposed software must make use of Canadian digital infrastructure (networking, compute, storage and/or sensors).
2. The proposed project must contribute to one or more of CANARIE's expected results:
 - (a) enhance opportunities for collaborative knowledge creation and innovation within Canada's research and education communities through the maintenance and development of the CANARIE network and related tools and services;
 - (b) expand the research and education community's access to and utilization of the CANARIE network and the availability of tools and programming that increase the effectiveness of its use;and
 - (c) enable the creation of innovative Information and Communications Technology (ICT) products and services and accelerate their commercialization in Canada.
3. Software development that is proposed must be technologically and economically viable within the timeframe of the project plan.
4. All funded work must be performed in Canada.
5. The Lead Contractor must be a Canadian university, college, corporation or other legally recognized entity.
6. No more than half of the membership and Board of Directors of the Lead Contractor can be composed of representatives or agents of the federal government.
7. In-kind contributions must be at least 15% of total eligible project costs.
8. Software developed with CANARIE funding must be made available for other researchers to use at no cost, through the CANARIE Research Software Registry at: <https://science.canarie.ca> for a period of 3 years from the end of the funded development period.

Scoring Criteria:

1. Overall assessment of the project;
 2. Extent to which the project supports the FAIR principles;
 3. Extent to which the project makes use of/contributes to digital research infrastructure;
 4. Extent to which the project contributes to a national data service;
 5. Extent to which the project integrates with international digital research infrastructure;
- and
6. Completeness/quality/sustainability of the project/design;

Appendix 5: Joint Security Project Criteria

Project proposals will be reviewed relative to the mandatory criteria and the scoring criteria. Evaluation of proposals relative to these criteria will constitute the basis for the decision whether or not a project is to receive CANARIE funding. Projects that fail to meet the mandatory criteria, or fail to meet evaluative criteria to an acceptable degree, cannot be funded.

These are the criteria against which proposals will be evaluated:

Participant Selection Procedure

Non-Funded Participation: All eligible applicants who do not require funding will be selected to participate.

CANARIE-Funded Participation: Institutions applying for funding must meet the following mandatory criteria:

1. All funded work must be performed in Canada.
2. The institution must be a Canadian university, college, corporation or other legally-recognized entity that is connected to the National Research and Education Network (NREN).
3. The institution must **not** be a federal government institution (federal department, agency, or Crown Corporation, including their research facilities).
4. No more than half of the membership and Board of Directors of the institution can be composed of representatives or agents of the federal government.

Initial Selection: Based on highest FTE count:

- 15 universities
- 2 community colleges / CEGEPs
- 2 research facilities housing Canadian science instruments
- 2 teaching hospitals

Secondary Selection – Remaining Applications:

- The institution with FTE count at the median point
- The institution with FTE count immediately below the median point
- A minimum of four (4) additional institutions to provide maximum geographical diversity

Platform Selection Procedure

A data aggregation and visualization platform will be selected through a competitive process. All proposals must meet the following mandatory criteria:

1. The institution must be a Canadian university, college, corporation or other legally recognized entity that is connected to the National Research and Education Network (NREN).
2. All funded work must be performed in Canada.
3. The institution must not be a federal government institution (federal department, agency, or Crown Corporation, including their research facilities) agency.
4. No more than half of the membership and Board of Directors of the institution can be composed of representatives or agents of the federal government.

All eligible proposals will be evaluated and ranked against the following scoring criteria in order to determine which proposal will be funded:

1. Extent to which the platform aggregates data from multiple security related feeds from any Intrusion Detection System, including Bro.

2. Extent to which the platform analytics and querying capabilities are optimized for cyber threats, security, and high performance.
3. Extent to which the platform provides extensible visualization capabilities optimized for cyber threats.
4. Extent to which the platform is able to collect data and provide project participants with access to the aggregated data and visualizations.
5. Extent to which the platform could be developed or enhanced to provide different algorithms, tools, and analytics.

Appendix 6: Digital Accelerator for Innovation and Research (DAIR) Program Criteria

Technology organizations in both the commercial arena and the academic research community spend a large portion of their capital and people resources to build R&D environments that enable product design, prototyping, validation and demonstration. This is particularly true where the products or research involve large scale systems composed of many servers and many clients.

As services migrate to network-based services, the cost of building a suitable environment can consume 50 percent or more of an overall development budget. In an effort to speed time-to-market and reduce product development costs, CANARIE has augmented the existing network with computing and storage resources and additional network access technologies.

DAIR Users Selection Criteria:

User applications to the DAIR Program will be evaluated to ensure that the proposed products and projects are a good technical fit for DAIR, that there are meaningful benefits to the applicant and that the applicant is qualified and able to use the services.

1. The applicant must be an entrepreneur or small or medium sized company (SME < 500 employees).
2. The applicant must be capable of using the requested resources in the identified time frame.
3. The proposed project must be a technical fit for the capabilities being delivered by DAIR.
4. The benefits to the applicant must be meaningful in terms of reducing capital and people costs and accelerating time to market.

In the event that the number of qualified applications exceeds the capacity of the DAIR system, applicants will be selected on a first-come, first-served basis.

Appendix 7: Program Revenues Financial Summary – March 31, 2019

The following table presents CANARIE's program revenue projections by initiative for the 2015 – 2020 mandate compared to the approved budget.

	Projections	Budget (\$ 000s)	Variance
PROGRAM REVENUES			
Legacy – IEP	827	827	
CAF Participation Fees	1,386	1,321	65
DAIR User Fees	7	7	
TOTAL PROGRAM REVENUES	2,220	2,155	65
MATCHING FUNDS			
Research Software	178	178	
NREN	5,346	5,318	28
DAIR	162	178	(15)
TOTAL MATCHING FUNDS	5,686	5,674	12
IN-KIND CONTRIBUTIONS			
Research Software	2,633	2,649	(17)
Research Data Management	425	425	
TOTAL IN-KIND CONTRIBUTIONS	3,057	3,074	(17)
TOTAL	10,963	10,903	61

Appendix 8: CANARIE Inc. Financial Statements – March 31, 2019

~ attached ~

CANARIE Inc.
Financial Statements
For the year ended March 31, 2019

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Independent Auditor's Report

To the members of CANARIE Inc.

Opinion

We have audited the financial statements of CANARIE Inc., which comprise the statements of financial position at March 31, 2019 and the statements of operations, changes in net assets and cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of CANARIE Inc. as at March 31, 2019 and its financial performance and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report. We are independent of CANARIE Inc. in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other Information

Management is responsible for the other information. The other information comprises the information included in the annual report.

Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information identified above and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

We obtained the annual report prior to the date of this auditor's report. If, based on the work we have performed on this other information, we conclude that there is a material misstatement of this other information, we are required to report that fact in this auditor's report. We have nothing to report in this regard.

BDO Canada LLP, a Canadian limited liability partnership, is a member of BDO International Limited, a UK company limited by guarantee, and forms part of the international BDO network of independent member firms.

BDO Canada s.r.l./S.E.N.C.R.L./LLP, une société canadienne à responsabilité limitée/société en nom collectif à responsabilité limitée, est membre de BDO International Limited, société de droit anglais, et fait partie du réseau international de sociétés membres indépendantes BDO.



Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing CANARIE Inc.'s ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate CANARIE Inc. or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing CANARIE Inc.'s financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of CANARIE Inc.'s internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on CANARIE Inc.'s ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause CANARIE Inc. to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.



We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

BDO Canada LLP

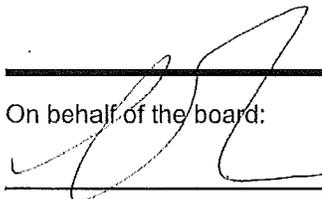
Chartered Professional Accountants, Licensed Public Accountants

Ottawa, Ontario
June 26, 2019

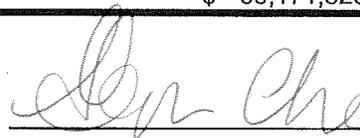
CANARIE Inc.
Statement of Financial Position

March 31	2019	2018
Assets		
Current		
Cash	\$ 1,209,539	\$ 954,602
Investments (Note 2)	8,403,362	9,756,142
Accounts and other receivable	685,014	539,702
Prepaid expenses and deposits (Note 3)	7,734,706	5,148,348
	18,032,621	16,398,794
Investments (Note 2)	-	391,144
Prepaid expenses and deposits (Note 3)	2,984,866	3,846,726
Tangible capital assets, assets under capital lease and intangible asset (Note 4)	12,154,333	12,520,318
	\$ 33,171,820	\$ 33,156,982
Liabilities and Net Assets		
Current		
Accounts payable and accrued liabilities (Note 5)	\$ 3,258,845	\$ 2,109,333
Deferred membership revenue	-	7,500
Deferred funding (Note 6)	4,704,768	4,759,642
Current portion of obligation under capital lease (Note 8)	224,157	214,812
	8,187,770	7,091,287
Deferred funding (Note 6)	3,137,704	4,025,302
Deferred capital funding (Note 7)	12,288,160	12,643,080
Obligation under capital lease (Note 8)	2,546,067	2,714,753
	26,159,701	26,474,422
Commitments (Note 9)		
Net Assets		
Unrestricted	185,934	418,699
Internally restricted royalty fund	2,383,275	2,341,291
Internally restricted for windup of operations	4,442,910	3,922,570
	7,012,119	6,682,560
	\$ 33,171,820	\$ 33,156,982

On behalf of the board:



Director



Director

CANARIE Inc.
Statement of Changes in Net Assets

For the year ended March 31	Unrestricted	Internally Restricted Royalty Fund (Note 10)	Internally Restricted for Windup of Operations (Note 10)	2019	2018
Balance, beginning of the year	\$ 418,699	\$2,341,291	\$3,922,570	\$6,682,560	\$6,455,197
Membership	287,700	-	-	287,700	263,204
Investment income	7,509	41,984	70,340	119,833	65,624
Expenses	(77,974)	-	-	(77,974)	(101,465)
Excess of revenues over expenses	217,235	41,984	70,340	329,559	227,363
	635,934	2,383,275	3,992,910	7,012,119	6,682,560
Interfund transfers	(450,000)	-	450,000	-	-
Balance, end of the year	\$ 185,934	\$2,383,275	\$4,442,910	\$7,012,119	\$6,682,560

The notes are an integral part of these financial statements.

CANARIE Inc.
Statement of Operations

For the year ended March 31	2019	2018
Revenues		
Industry Canada / ISED funding	\$ 22,248,299	\$ 21,022,664
Membership	287,700	263,204
Investment income	119,833	65,624
	<hr/>	<hr/>
	22,655,832	21,351,492
Expenses (Schedule)		
Program	18,649,770	16,701,358
Operating	3,542,440	3,185,493
Corporate	77,974	101,465
Joint Security Project	56,089	1,135,813
	<hr/>	<hr/>
	22,326,273	21,124,129
Excess of revenues over expenses	\$ 329,559	\$ 227,363

CANARIE Inc.
Schedule of Expenses

For the year ended March 31	Program	Operating	Corporate	Joint Security Project	2019 Total
Direct program	\$11,599,556	\$ -	\$ -	\$ 50,202	\$ 11,649,758
Employee and consultants	3,723,405	2,482,142	25,436	5,887	6,236,870
Marketing and promotion	307,948	123,039	26,110	-	457,097
Travel	247,944	79,498	-	-	327,442
Rent	-	339,854	-	-	339,854
General office and supplies	55,501	179,873	15,364	-	250,738
Meetings and conferences	40,426	94,051	-	-	134,477
Equipment, software and maintenance	57,566	113,991	-	-	171,557
Professional fees	92,827	24,917	-	-	117,744
Interest on obligation under capital lease	118,695	-	-	-	118,695
	16,243,868	3,437,365	66,910	56,089	19,804,232
Plus: amortization	2,405,902	105,075	11,064	-	2,522,041
	\$18,649,770	\$3,542,440	\$ 77,974	\$ 56,089	\$ 22,326,273

CANARIE Inc.
Schedule of Expenses

For the year ended March 31	Program	Operating	Corporate	Joint Security Project	2018 Total
Direct program	\$10,863,731	\$ -	\$ -	\$1,027,520	\$11,891,251
Employee and consultants	3,089,897	2,245,218	19,555	103,947	5,458,617
Marketing and promotion	242,054	88,274	51,115	1,882	383,325
Travel	203,087	73,527	-	2,407	279,021
Rent	-	337,177	-	-	337,177
General office and supplies	31,381	141,195	11,143	-	183,719
Meetings and conferences	33,210	53,582	-	-	86,792
Equipment, software and maintenance	51,093	104,415	-	57	155,565
Professional fees	-	27,662	954	-	28,616
Interest on obligation under capital lease	71,073	-	-	-	71,073
	14,585,526	3,071,050	82,767	1,135,813	18,875,156
Plus: amortization	2,115,832	114,443	18,698	-	2,248,973
	\$16,701,358	\$3,185,493	\$ 101,465	\$1,135,813	\$21,124,129

CANARIE Inc.
Statement of Cash Flows

For the year ended March 31	2019	2018
Cash flows from operating activities		
Industry Canada / ISED funding	\$ 20,400,000	\$ 22,300,000
Membership	280,200	263,204
Program - interest	175,203	125,679
Program - user fees	260,933	248,992
Investment income - Corporate	7,509	5,102
Investment income - Royalty Fund	41,984	23,562
Investment income - Windup of Operations	70,340	36,960
Program expenses	(16,947,396)	(15,290,165)
Operating expenses	(3,442,920)	(3,272,782)
Corporate expenses	(16,474)	(63,211)
Joint Security Project expenses	(56,089)	(1,135,813)
	<u>773,290</u>	<u>3,241,528</u>
Cash flows from investing activities		
Acquisition of tangible capital assets and intangible asset	(1,993,376)	(2,227,083)
Proceeds on disposal of tangible capital assets	180	150
Purchase of investments	(18,786,103)	(25,190,016)
Proceeds from disposal of investments	20,530,027	25,016,670
	<u>(249,272)</u>	<u>(2,400,279)</u>
Cash flows from financing activities		
Repayment of obligation and interest under capital lease	(269,081)	(269,081)
	<u>(269,081)</u>	<u>(269,081)</u>
Net increase in cash	254,937	572,168
Cash, beginning of the year	<u>954,602</u>	<u>382,434</u>
Cash, end of the year	<u>\$ 1,209,539</u>	<u>\$ 954,602</u>

CANARIE Inc.
Notes to Financial Statements

March 31, 2019

1. Significant Accounting Policies

Purpose of Organization

CANARIE Inc. was incorporated on March 5, 1993 as a non-profit organization without share capital under Part II of the Canadian Corporations Act. CANARIE Inc. was continued under section 211 of the Canada Not-for-profit Corporations Act on November 19, 2013. The objective of CANARIE Inc. is to support the development of the communications infrastructure for a knowledge-based Canada.

As a corporation constituted exclusively for the purpose of carrying on or promoting scientific research and experimental development, CANARIE Inc. is exempt from the payment of income taxes under Section 149(1)(J) of the Income Tax Act (Canada).

Basis of Accounting

The financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations.

Use of Estimates

The preparation of financial statements in accordance with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from management's best estimates as additional information becomes available in the future. Areas of significant estimates include useful lives of tangible capital assets, assets under capital lease and intangible asset.

Deferred Funding

Deferred funding relates to (1) funding received, including interest earned on funding, user fees collected and other recovered eligible costs, in advance of the funding period; (2) funding received for future service; and (3) funding received with respect to the purchase of tangible capital assets, assets under capital lease and intangible asset.

When tangible capital assets, assets under capital lease and intangible asset are disposed, the proceeds increase the deferred funding balance and the net book value decreases the deferred funding balance related to tangible capital assets, assets under capital lease and intangible asset.

CANARIE Inc.
Notes to Financial Statements

March 31, 2019

1. Significant Accounting Policies (continued)

Revenue Recognition The organization follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Funding related to tangible capital assets, assets under capital lease and intangible asset is deferred and recognized as revenue in the same year as the amortization expense of the related tangible capital assets, assets under capital lease and intangible asset.

Service contracts are recognized over the period of the services provided.

Membership fees are recognized over the period of membership.

Financial Instruments

Measurement

The organization initially measures its financial assets and liabilities at fair value. The organization subsequently measures all its financial assets and liabilities at amortized cost, except for short-term investments which it chose to measure at fair value. Changes in fair value are recognized in the statement of operations.

Impairment

Financial assets measured at amortized cost are tested for impairment when there are indicators of impairment.

Transaction costs

The organization recognizes its transaction costs in the statement of operations in the year incurred for financial instruments measured at fair value. Financial instruments that are subsequently measured at amortized cost are adjusted by the transaction costs in the initial measurement of the asset or liability.

CANARIE Inc.
Notes to Financial Statements

March 31, 2019

1. Significant Accounting Policies (continued)

Tangible Capital Assets and Intangible Asset	<p>Tangible capital assets and intangible asset are stated at cost less accumulated amortization. Amortization is provided on the basis of their useful lives using the following methods and annual rates:</p> <table><tr><td>Computer equipment</td><td>3 years straight-line basis</td></tr><tr><td>Equipment</td><td>3 years straight-line basis</td></tr><tr><td>Leasehold improvements</td><td>over the term of the lease</td></tr><tr><td>Furniture</td><td>5 years straight-line basis</td></tr><tr><td>Network equipment</td><td>5 years straight-line basis</td></tr><tr><td>Computer software</td><td>2 years straight-line basis</td></tr></table>	Computer equipment	3 years straight-line basis	Equipment	3 years straight-line basis	Leasehold improvements	over the term of the lease	Furniture	5 years straight-line basis	Network equipment	5 years straight-line basis	Computer software	2 years straight-line basis
Computer equipment	3 years straight-line basis												
Equipment	3 years straight-line basis												
Leasehold improvements	over the term of the lease												
Furniture	5 years straight-line basis												
Network equipment	5 years straight-line basis												
Computer software	2 years straight-line basis												
Impairment of Tangible Capital Assets and Intangible Asset	<p>When a tangible capital asset or intangible asset no longer has any long-term service potential to the organization, the excess of its net carrying amount over any residual value is recognized as an expense in the statement of operations.</p>												
Leases	<p>Leases are classified as capital or operating leases. A lease that transfers substantially all of the benefits and risks incidental to the ownership of property is classified as a capital lease. All other leases are accounted for as operating leases wherein rental payments are expensed as incurred.</p> <p>Assets under capital lease are stated at cost less accumulated amortization. They are amortized on a straight-line basis over the expected useful life of the asset to the organization, not to exceed twenty years, which currently corresponds to the term of the lease.</p>												
Contributed Services	<p>During the year, voluntary services (including donated time and travel of board and committee members) were provided. Because of the difficulty of determining their fair value, contributed services are not recognized in the financial statements.</p>												
Presentation of Expenses	<p>Program development, design and implementation activities are classified as program expenses. Activities for specific security initiatives in support of research and education are classified as Joint Security Project expenses. Activities which are not directly in support of Programs or security initiatives are classified as operating expenses. Activities not eligible for funding under the current contribution agreement are classified as either corporate or royalty fund expenses.</p>												

CANARIE Inc.
Notes to Financial Statements

March 31, 2019

2. Investments

Investments consist of Canadian government treasury bills with annual yields of 1.68% maturing on June 2019, short-term provincial government coupon bonds with annual yields ranging from 1.71% to 2.10% and maturities ranging from April 2019 to January 2020, short-term guaranteed investment certificates with annual yields ranging from 1.98% to 2.59% and maturities ranging from April 2019 to February 2020, and cash held in investment savings accounts with an annual yield of 1.60%.

3. Prepaid Expenses and Deposits

	<u>2019</u>	<u>2018</u>
Program prepayments and deposits	\$10,561,849	\$ 8,837,032
Operating prepayments	121,223	121,542
Rental deposit	36,500	36,500
	<hr/>	<hr/>
Balance, end of the year	10,719,572	8,995,074
	<hr/>	<hr/>
Current portion	7,734,706	5,148,348
	<hr/>	<hr/>
Long-term portion	\$ 2,984,866	\$ 3,846,726

CANARIE Inc.
Notes to Financial Statements

March 31, 2019

4. Tangible Capital Assets, Assets under Capital Lease and Intangible Asset

	2019		2018	
	Cost	Accumulated Amortization	Cost	Accumulated Amortization
Computer equipment	\$ 631,349	\$ 451,226	\$ 504,312	\$ 356,820
Equipment	132,345	125,721	132,345	120,753
Leasehold improvements	464,519	455,632	464,519	434,433
Furniture	232,816	212,651	232,816	196,542
Network equipment	12,995,753	9,772,732	11,166,618	8,366,775
Fibre under capital lease	12,674,885	4,061,883	12,576,540	3,086,535
Computer software	202,629	100,118	101,089	96,063
	\$27,334,296	\$ 15,179,963	\$25,178,239	\$ 12,657,921
Net book value		\$ 12,154,333		\$ 12,520,318

During the year, computer equipment with a cost of \$15,773 (2018 - \$9,516) and accumulated amortization of \$15,773 (2018 - \$9,516) was disposed and removed from the total cost and total accumulated amortization.

Accounts payable and accrued liabilities include purchased tangible capital assets with a cost of \$162,863 (2018 - \$Nil).

During the year, the organization acquired fibre under capital leases with a cost of \$98,345 (2018 - \$3,232,189), with a total of \$Nil (2018 - \$1,559,637) being financed through the obligation under capital lease.

5. Accounts Payable and Accrued Liabilities

	2019	2018
Accounts payable and accrued liabilities	\$ 3,215,860	\$ 2,069,198
Government remittances payable	42,985	40,135
	\$ 3,258,845	\$ 2,109,333

CANARIE Inc.
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6. Deferred Funding

Pursuant to Funding Agreements signed on October 9, 2015, September 4, 2012, March 28, 2007, and March 28, 2002, the organization received funding of \$77,700,000, \$62,000,000, \$120,000,000 and \$110,000,000 respectively from Innovation, Science and Economic Development Canada ("ISED") (formerly known as Industry Canada) for the design, development, deployment, improvement and operations of the CANARIE network and programs.

In 2015, the organization was granted permission from Industry Canada / ISED to retain \$817,821 from an HST recovery to support the Joint Security Project. As of March 31, 2019, the total cumulative expenses for the Joint Security Project are \$1,244,063. The excess of the total cumulative expenses for the Joint Security Project were funded through ISED funding.

The balance of the funds has been reflected as follows:

	<u>2019</u>	<u>2018</u>
Balance, beginning of year	\$ 8,784,944	\$ 8,498,695
Industry Canada / ISED funding received	20,400,000	22,300,000
Program - user fees	364,825	340,293
Program - interest	175,203	125,679
Program - service contracts	10,879	192,680
Direct program and operating expenses	(19,681,233)	(17,656,576)
Transfer to operating for the acquisition of tangible capital assets, assets under capital lease and intangible asset	(2,156,057)	(3,880,014)
Joint Security Project expenses	(56,089)	(1,135,813)
Balance, end of year	<u>7,842,472</u>	<u>8,784,944</u>
Current portion	<u>4,704,768</u>	<u>4,759,642</u>
Long-term portion	<u>\$ 3,137,704</u>	<u>\$ 4,025,302</u>

CANARIE Inc.
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7. Deferred Capital Funding

Deferred capital contributions represent amounts funded by Industry Canada / ISED for the purchase of tangible capital assets, assets under capital lease and intangible asset. Deferred funding related to tangible capital assets, assets under capital lease and intangible asset is summarized below:

	<u>2019</u>	<u>2018</u>
Balance, beginning of year	\$12,643,080	\$10,993,341
Funding received related to the acquisition of tangible capital assets, assets under capital lease and intangible asset	2,156,057	3,880,014
Amortization of program and operating assets	<u>(2,510,977)</u>	<u>(2,230,275)</u>
Balance, end of year	<u>\$12,288,160</u>	<u>\$12,643,080</u>

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8. Obligation Under Capital Lease

	2019	2018
Capital lease for infeasible rights of use of fibre, 4.35%, due December 2024, payable by monthly installments of \$22,423, principal and interest.	\$ 1,155,116	\$ 1,369,928
Capital lease for infeasible rights of use of fibre, 3.50%, due April 2020, payable by one installment of \$1,672,553, principal and interest	1,615,108	1,559,637
	2,770,224	2,929,565
Less: current portion	224,157	214,812
	\$ 2,546,067	\$ 2,714,753

Minimum lease payments required in the next five years under the capital lease are as follows:

2020		\$ 269,081
2021		1,941,632
2022		269,081
2023		269,081
2024		201,810
		2,950,685
Less: interest included in minimum payments		180,461
		\$ 2,770,224

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9. Commitments

The organization's current lease for its premise expires on August 31, 2019. On October 24, 2018, the organization entered into a new lease agreement commencing on September 1, 2019, which expires August 31, 2024. Future minimum annual lease payments under this operating lease (which includes base rent and the current charge for additional rent) for the premise are due as follows:

2020	\$ 352,397
2021	361,880
2022	370,731
2023	377,053
2024	377,053
Thereafter	<u>157,105</u>
	<u>\$ 1,996,219</u>

As at March 31, 2019, the organization had commitments of \$9,882,582 with respect to the Network, DAIR, Research Software, NREN and Research Data Management programs.

10. Internally Restricted Net Assets

Royalty Fund

During the 2007/2008 fiscal year, Industry Canada granted CANARIE Inc. the authority to retain royalties collected after March 31, 2007 and to use these funds in a manner to be determined by CANARIE Inc. and its legal counsel. Annual allocations to the fund include investment income of \$41,984 (2018 - \$23,561). Disbursements from the fund represent payments to approved funded projects. The fund cannot be reallocated without the approval of the Board of Directors.

Windup of Operations

During the 1998 fiscal year, CANARIE Inc. established a fund for the eventual wind up of its operations or for the transition to a new mode of business. In either event, the fund will be used to pay operating expenses. The objective was to allocate to the fund an amount between 50% and 75% of the organization's annual operating budget. Management performs an annual review of the sufficiency of this fund and confirms that its objective is met. Annual allocations to the fund include investment income of \$70,340 (2018 - \$36,960). At March 31, 2019, the organization transferred \$450,000 from its unrestricted net assets to Windup of Operations to maintain the fund. The fund cannot be reallocated without the approval of the Board of Directors.

CANARIE Inc.
Notes to Financial Statements

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11. Economic Dependence

On October 9, 2015, ISED entered into a contribution agreement with CANARIE Inc. to contribute funding totaling \$105,000,000. Of the total contribution, \$15,000,000 was received in fiscal 2016, \$20,000,000 was received in fiscal 2017, \$22,300,000 was received in fiscal 2018 and \$20,400,000 was received in the fiscal 2019. The contribution agreement was amended on March 29, 2019 and increased the total funding to \$113,658,824. The current contribution agreement will end on March 31, 2020. Should this funding not be continued or it cannot be replaced, the organization would not be able to continue its operations at the current level.

12. Financial Instruments

Interest rate risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. Fixed rate instruments subject the organization to a fair value risk while variable rate instruments subject it to a cash flow risk. The organization is exposed to this risk for its short-term investments. The risk associated with investments is reduced to a minimum since these assets are invested in short-term maturities.