CANARIE Annual Business Plan 2021-22

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1 Executive Summary

CANARIE is pleased to present its Annual Business Plan for fiscal year 2021-22 (FY22), the second year of the 2020-24 mandate. The document includes past accomplishments as well as CANARIE's plans to achieve its expected results. Risks and risk mitigation strategies are also presented.

Role of CANARIE

CANARIE connects Canadians to each other and to the world. Our programs equip Canadian researchers, students, and startups to excel on the global stage.

Together with our thirteen provincial and territorial partners, we form Canada's National Research and Education Network (NREN). This ultra-high-speed network connects Canada's researchers, educators, and innovators to each other and to global data, technology, and colleagues.

Beyond the network, we fund and promote the development of software for research and national efforts to manage data generated from research. To strengthen the security of Canada's research and education sector, we collaborate with our partners in the NREN, government, academia, and the private sector to fund, implement, and support cybersecurity initiatives. We also provide identity management services to the academic community and boost Canada's startups with cloud resources and expertise in emerging technologies.

Established in 1993, we are a non-profit corporation, with most of our funding provided by the Government of Canada.

Focus of Activities: FY22 (April 1, 2021 to March 31, 2022)

CANARIE's focus in its new mandate is on amplifying the impact of Canada's digital infrastructure, as Canadians engaged in data-intensive, collaborative research and innovation are increasingly dependent on this critical infrastructure.

In FY22, CANARIE will continue to launch and execute programs that build on strong foundations and evolve to support better alignment and integration of the components of Canada's digital research infrastructure.

In addition to the ongoing management of the CANARIE network and other programs, key planned activities, and outcomes for FY22 include:

- Launching new initiatives that will enhance the cybersecurity of eligible organizations connected to the NREN that are recommended by the Cybersecurity Advisory Committee and its standing committees, under the Cybersecurity Initiatives Program;

- Deployment of additional network capacity to support Northern connectivity, and activities to support the newest NREN partner organization in Nunavut;

- Ongoing execution of projects that support development and reuse of research software under Research Software platform Call 3 and Local Research Software Support Initiative Call 1;

- Ongoing execution of projects that support the development of findable, accessible, interoperable, and reusable (FAIR) research data under Research Data Management Call 2;

- Ongoing execution of projects that create, extend, or maintain network infrastructure on regional and territorial partner networks under NREN Call 1;

- Development of additional BoosterPacks for the DAIR cloud environment to catalyze the use of transformative technologies by Canadian SMEs;

- Coordinated activities with the New Digital Research Infrastructure Organization (NDRIO) to facilitate the transition of Research Software, Research Data Management, and Research Data Canada activities by the end of FY22; and

- Continued evolution of a Global Research and Education Network (GREN) map to provide dynamic visualizations of global connectivity, down to the institutional level.

Focus of Activities: 2020 – 2024 Mandate

CANARIE's programming and activities during the 2020-2024 mandate will be defined by the following trends that are shifting the research and innovation landscape:

1) the continued digitization of research,

2) the growing need for cybersecurity,

3) the adoption of cloud technologies in all sectors, and

4) the development of a new organization to manage the federal investment in advanced research computing, research data management, and research software.

CANARIE activities in the 2020-2024 mandate are focused on the following three areas which align directly with the Expected Results outlined in CANARIE's Contribution Agreement with the Government of Canada.

Network Operations

To deliver a world-class, high performance network and network-based services, CANARIE will:

a) Increase network capacity and performance to keep pace with the growth in demand (FY20 grew ~26% over FY19 annual traffic);

b) Expand network reach and redundancy to address the needs of research and education communities from coast to coast to coast;

c) Strengthen the overall security posture of the national research and education network, and better understand its vulnerabilities;

d) Support the development of security capability at NREN-connected institutions; and

e) Evolve the network services portfolio, including identity management, to enhance research, collaboration, and innovation.

Technology Innovation

To bring new collaboration capabilities not previously offered to Canada's research community by creating and funding new software technologies, CANARIE will:

a) Test network-driven and network-enabled technologies to support the research workflow;

b) Drive the adoption of software tools and services to utilize and exploit data;

c) Develop new tools and services to support cybersecurity in the research and education ecosystem;

d) Increase the impact of tools and services to users;

e) Support research data management through the development of tools and applications; and

f) Promote the collaborative development of data management tools.

Private Sector Innovation

To stimulate commercialization CANARIE will:

a) Leverage the network to support innovation, development and adoption of transformative ICT technologies, including DAIR (the Digital Accelerator for Innovation and Research);

b) Facilitate academic and private sector partnerships to drive collaborative innovation and commercialization; and

c) Facilitate access to the CANARIE network to support the CENGN (Centre of Excellence in Next Generation Networks) testbed capabilities across Canada.

2 2020-21 Accomplishments to Date

2020-21 (FY21) is the first year of CANARIE's 2020-2024 mandate. The following sections provide an overview of CANARIE's accomplishments in FY21 to date under each of the three Eligible Activities outlined in the Contribution Agreement that governed that mandate, along with information on outstanding projects for completion. The balance of 2020-21 accomplishments will be captured in the Annual Report.

2.1 Network Operations

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 from coast-to-coast across Canada. In high-use, high-growth network corridors, CANARIE purchased fibre and therefore has the flexibility to add capacity and deploy transformative technologies quickly and at a considerably lower incremental cost, especially as network traffic is returning to pre-COVID-19 pandemic levels and is expected to continue its exponential growth in the future. This connectivity is protected by leased services, which provide necessary network diversity.

Thus far in FY21, CANARIE:

- Welcomed Nunavut Arctic College as the host organization for the NREN partner in Nunavut, thereby completing Canada's NREN with representation in all provinces and territories. In the short term, CANARIE will support the technical and administrative development of the new NREN partner

- Increased network redundancy in Vancouver, Montreal, and the Atlantic region

- Continued leading an international working group tasked with creating a dynamic visualization of the Global Research and Education Network, using Canada's NREN as a beta version of the map

- Launched the Cybersecurity Initiatives Program, and the first funded initiative, CIRA's DNS Firewall

- Hosted the third annual initiatives planning meeting of provincial and territorial network staff at the NREN Assembly, the first to be held virtually

- Jointly co-hosted, with our 13 Canadian NREN partners the first ever NREN Summit, a virtual event that looked at how innovative and determined Canadians leveraged our national, digital infrastructure ecosystem to support mission-critical activities: education, COVID-19 research, and securing Canada's critical data and services

- Inaugurated the Cybersecurity Advisory Committee and related standing committees to leverage the expertise within the community to guide the evolution of CANARIE's Cybersecurity Initiatives Program, and cybersecurity in the research and education sector more broadly

Key projects to be completed before the end of FY21 include:

- Relocate CANARIE's Point of Presence (of network equipment, services, and associated peering connections) in Ottawa to a new home

- Refresh the western section of the network optical system

- Launch the second initiative under the Cybersecurity Initiatives Program

2.2 Technology Innovation

Research Software

CANARIE continued to champion the development of powerful research software tools that accelerate discovery and enable researchers to focus their time and funding on research activity rather than software development. Research software enables users to seamlessly access digital infrastructure and resources without having expert knowledge of these infrastructures, thereby expanding use of these resources across many research domains.

These tools are available via CANARIE's online research software portal (science.canarie.ca). The online portal, the first of its kind in Canada, allows users to find reusable software services and examine each service's availability and usage statistics. The portal creates a national clearinghouse for research software and provides seamless access to advanced software tools in order to spur broad adoption by the research community.

Thus far in FY21, CANARIE:

- Executed on platform Call 3, to support research teams who will adapt existing research platforms for re-use by new research teams

- Executed on Local Research Software Support Initiative Call 1, to support the development of on-campus teams of research software experts

Due to the COVID-19 pandemic, and the resulting public health requirements, the 2020 Canadian Research Software Conference was cancelled.

Research Data Management

The ability to reuse research data accelerates opportunities for creating new knowledge and maximizes the return on investment of research funding. To support Canada's research data management ecosystem, CANARIE funds the development of software and tools to support the research data management workflow and support the work of Research Data Canada.

Thus far in FY21, CANARIE:

- Executed on RDM Call 2, to support collaborative interoperability and integration of data repositories and systems within Canadian and global digital research infrastructures

- Completed funding for the Canadian Association of Research Libraries' (CARL) Portage Network to build capacity and coordinate activities in research data management

Key projects to be completed before the end of FY21 include:

- Hosting the 2021 National Data Services Framework Summit (virtually)

Innovation Fund

The digital research infrastructure needs of the research and education community can (and do) evolve significantly during the term of CANARIE's mandate. Additionally, Information Technology (IT) capabilities or demands on IT continue to evolve, often significantly. For example, current investments in cybersecurity are being driven by the pervasive use of IT in all facets of society which was unforeseen a number of years ago. The CANARIE governance model enables it to respond to the demands in a manner that aligns with CANARIE's Contribution Agreement. The role of the Innovation Fund is to ensure CANARIE is able to respond to these demands.

The Innovation Fund is not new for this mandate. In the prior mandate for example, the Innovation Fund was used to respond to the needs of the community for national Research Data Management (RDM), and also to maximize participation in Phase 1 of the Joint Security Project pilot.

It is anticipated at this time, that the Innovation Fund will be used to pursue technology innovation within the area of cybersecurity in partnership with the global community. These areas include zero trust networking and use of machine learning and predictive analytics to be able to anticipate cybersecurity threats.

Given the fact that the Innovation Fund supports emerging projects, the planning phase for these projects occurs earlier in the mandate, with the actual projects not in place until later in the mandate. As a result, no demands on the Innovation Fund are expected in FY21.

2.3   Private Sector Innovation

Under Private Sector Innovation activities, CANARIE leveraged its infrastructure and relationships to support adoption of digital technologies by Canadian SMEs to advance innovation and commercialization.

Thus far in FY21, CANARIE:

- Began work to solicit Canadian small and medium business to act as builders for the second set of BoosterPacks, packages of cloud resources and curated knowledge about emerging technologies

- Launched the new Innovation and Commercialization Committee (ICC) made up of representatives from business incubators and accelerators, DAIR graduates and other SMEs, and innovation leaders, to provide guidance to CANARIE on Private Sector Innovation

Key projects to be completed before the end of FY21 include:

- Launch the next set of BoosterPacks
- Operationalize the Innovation and Commercialization Committee (ICC)

3 2021-22 Planned Activities

FY22 is the second fiscal year of CANARIE's 2020-2024 mandate. In order to deliver on its expected results for the mandate, CANARIE will undertake the following activities in the 2021-22 fiscal year:

3.1 Network Operations

CANARIE will continue to undertake all required activities to support and evolve the existing CANARIE network and the services delivered over it.

1) Network Program – As a result of this program, the CANARIE network will continue to operate and evolve as essential research infrastructure to support research, education, and innovation. To achieve the results of this program, the following activities will be undertaken in the 2021-22 fiscal year:

   i. Operate the network

   ii. Increase capacity, redundancy, and reliability

   iii. Continue to enhance network security, and measurement and monitoring tools

   iv. Continue to enhance user access to support tools

   v. Continue to develop software-driven network services

   vi. Operate the Distributed Denial of Service (DDoS) detection system

   vii. Provide a sustainable cybersecurity monitoring service by efficiently managing and integrating the SIEM (Security Information and Event Management) systems deployed on CANARIE infrastructure and network, and at each NREN Partner

   viii. Promote and implement in-house cybersecurity expertise

   The following measurable short- and medium-term outcomes will be achieved in FY22:

   - Deployment of additional network capacity to support traffic growth

   - Deployment of additional network capacity to support Northern connectivity

   - Improvement of network security reporting, monitoring and measurement system

   - Deployment of Software Networking Applications

   - Deployment of support tools accessible through the user portal

   - Improved commercial cloud support

   - Improvement of the Global Research and Education Network (GREN) Map

   - Adoption of NIST Risk Management Methodology for internal network Threat Risk Assessment

   - Operate the Distributed Denial of Service (DDoS) detection system dedicated to the CANARIE network and actively collaborate with NREN partners on the validation of incident data and delivery of mitigation options

2) Infrastructure Extension Program (IEP) – As a result of this program, government research institutes will continue to leverage the research network in support of collaborative research

with national and international partners. To achieve the results of this program, the following activities will be undertaken in the 2021-22 fiscal year:

    i. Provide high-speed network connections to government research facilities

    ii. Ensure connections are adequate to meet user needs

The following measurable short- and medium-term outcome will be achieved in FY22:

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

3) Canadian Access Federation (CAF) Program – As a result of this program, Canada will continue to benefit from robust identity and access management services that enable secure and efficient remote access to distributed resources and tools, anytime. To achieve the results of this program, the following activities will be undertaken in the 2021-22 fiscal year:

    i. Promote the adoption of the *eduroam* Configuration Assistant Tool (CAT) profile to elevate the security posture of the entire *eduroam* community

    ii. Work with the Trust and Identity committee to plan how CAF can augment the Cybersecurity Initiatives Program

    iii. Expand the number of sites that broadcast *eduroam* in the community to offer options for distance learning and creative utilization of community space

    iv. Develop technical recommendations which simplify cloud and Multi Factor Authentication (MFA) integration with Federated Identity Management (FIM) to address cybersecurity concerns and increase adoption of Federated Identity Management in the community

    v. Expand the portfolio of identity-based services

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Increased adoption of CAF

- Increased number of *eduroam* log-ins per year, following the decline in March 2020 due to COVID-19.

- Increased number of projects to upgrade the capacity/capability of the federation. The number of CAF projects is projected to grow to 23 by the end of FY22 based on the FY21 count of 20

- Increased number of interfaces, applications, and tools available to support CAF services. The number of CAF tools available to support CAF services is projected to grow to 9 by the end of FY22 based on the FY21 count of 8

4) Cybersecurity Initiatives Program (CIP), referred to as the Joint Security Project in CANARIE's Contribution Agreement – To achieve the results of this program, the following activities will be undertaken in the 2021-22 fiscal year:

    i. Continue to implement the DNS Firewall initiative at eligible organizations.

    ii. Implement the Intrusion Detection System (IDS) initiative.

    iii. Complete the launch of the Threat Feed initiative and begin implementation.

  iv. Leverage the NREN Partners to provide program outreach, technical/operational support, and support cybersecurity enablement.

  v. Work with the Measurement and Metrics Working Group (MM WG) to define a framework to assess the ongoing state of cybersecurity in the research and education sector

  vi. Work with the Cybersecurity Advisory Committee (CAC) and its subcommittees to define the next set of Cybersecurity initiatives

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Next set of Cybersecurity initiatives defined
- DNS Firewall, Intrusion Detection System, and Threat Feed initiatives deployed at eligible organizations
- First draft of a cybersecurity assessment framework developed

5) NREN Program – The NREN Program initiatives will continue to evolve the NREN such that it acts in a coordinated manner to advance common national objectives, while respecting and leveraging the diversity within the federated model. NREN partner engagement will be increased, and initiatives will be better integrated to support this vision. To achieve this, the following activities will be undertaken in the 2021-22 fiscal year:

  i. Extend capacity, redundancy, reliability, and security through Provincial and Territorial NREN Partners' networks

  ii. Connect institutional facilities

  iii. Strengthen cybersecurity of the NREN

  iv. Strengthen the NREN in the North

  v. Further enhance the processes and capacity of the NREN

The following measurable short- and medium-term outcomes will be achieved in FY21

- Completion of second competitive funding call issued to meet NREN partners' requirements
- Technical audits of funded projects
- Increased reliability, capacity, and security on network segments shared by NREN partners
- Increase NREN security through continuation of the NREN SIEM project
- Development and launch of projects to enhance security
- Continued progress towards the technical implementation of the Nunavut NREN partner
- Organization of an NREN Assembly event to foster engagement between NREN Partners

3.2 Technology Innovation

1) Research Software – As a result of this program, CANARIE will continue to develop software tools that enhance the usability and accessibility of research infrastructure for all Canadian

researchers. To achieve the results of this program, the following will be undertaken in the 2021-22 fiscal year:

i. Continue to promote the research software portal at science.canarie.ca

ii. Support and monitor funded projects in platform Call 3 in their maintenance phase

iii. Support and monitor funded projects under the Local Research Software Support Call 1

iv. Continue to work with participants in the Local Research Software Support Initiative Call 1 to support computational researchers at the institution level, including defining meaningful metrics and best practices

v. End of development technical audits and financial audits of projects in platform Call 3

vi. Host the 2021 Canadian Research Software Conference (CRSC)

vii. Support the transition of activities to the new DRI organization at the end of FY22

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Enhanced documented metrics and best practices for the Local Research Software Support Initiative

- Financial and technical audits of the development portion of funded projects under platform Call 3

- Transition to the maintenance portions of projects funded under platform Call 3

- Canadian Research Software Conference 2021 held and feedback from attendees documented

2) Research Data Management – As a result of this program, CANARIE will contribute towards a future state where Canada's publicly funded data is available to accelerate discovery and commercialization by the academic and private sectors. The following activities will be undertaken in the 2021-22 fiscal year:

i. Community coordination in support of open science, policy creation, national standards, infrastructure, and tools

ii. National engagement activities designed to facilitate the development and deployment of national data services that benefit all publicly funded research organizations

iii. Communication with international data infrastructure organizations to work towards compatibility and interoperability with international approaches

iv. Support and monitor funded projects

v. Technical and financial audits of funded projects

vi. Execution of activities in the RDC Roadmap to advance research data management priorities

vii. Support the transition of activities to the new DRI organization at the end of FY22

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Execution underway for all approved projects in Research Data Management Call 2

- Development of an action plan for RDC's outreach efforts, including Canada's National Data Services Framework

- Financial audits of Call 2 funded projects completed as required

- Development and use of RDM services, tools and platforms that enable Canadians to adopt RDM practices and comply with evolving funder policy

- Development of end-of-project metrics that demonstrate the impact of targeted funding to the RDM community

3) Innovation Fund – To support technology innovations and community needs defined during the mandate, the following activities will be undertaken in the 2021-22 fiscal year:

    i. Complete community consultation on potential projects to be funded under the Innovation Fund.

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Initial project to be supported is defined

3.3 Private Sector Innovation

The activities undertaken will include delivery of the following programs, along with key initiatives listed under each program:

1) DAIR Cloud Program – As a result of this program, CANARIE will continue to leverage the CANARIE network to support Canadian firms' ability to develop and test innovative ICT applications. To achieve the results of this program, the following activities will be undertaken in the 2021-22 fiscal year:

    i. Operate the cloud platform (embracing updates to the platform core technologies as necessary)

    ii. Enhance technical capabilities of the DAIR cloud infrastructure with features to help users reduce time to market

    iii. Create and publish educational content related to efficient and secure use of cloud resources and services

    iv. Create a community forum for information exchange between private sector innovators

    v. Evolve the DAIR BoosterPack Catalogue to include additional BoosterPacks (training materials and source code developed by Canadian SMEs focused on emerging technologies)

    vi. Cultivate strategic partnerships to add value for the DAIR user community, contributing toward the evolution of a consolidated cloud service

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Increased usage of DAIR

- New features added to the DAIR cloud platform

- Content released to educate SMEs on cloud independence and security in the cloud

- Monitor ongoing cloud usage patterns of SMEs as they develop and test cloud-based applications and services

- Provide additional BoosterPack Tutorials, to reduce the time and cost for SMEs to develop new technology skills

- Further advance the partnership between DAIR and CENGN, making participant transitions between programs more apparent and seamless

2) CENGN Network Testbed – As a result of this program, the CANARIE network will be used to foster innovation and commercialization of new ICT technologies in partnership with CENGN. To achieve the results of this program, the following activities will be undertaken in the 2021-22 fiscal year:

    i. Ensure network connectivity and related support for CENGN test bed initiative

The following measurable short- and medium-term outcome will be achieved in FY22:

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

3.4 Activities Supporting Equity, Diversity, and Inclusion

In order to advance Equity, Diversity, and Inclusion (EDI), the following activities will be undertaken in the 2021-22 fiscal year:

    i. Continued use of institutional Equity, Diversity, and Inclusion plans as an adjudication criterion for funding selection where appropriate

    ii. Work with partners in the DRI ecosystem to coordinate joint policy positions on Equity, Diversity, and Inclusion

    iii. Training for CANARIE leadership on foundational EDI elements

    iv. Incorporation of EDI objectives in the NREN Strategic Plan including:

- Alignment on a common definition

- Alignment on why EDI is important

- Training for the NREN GC

    v. Tracking of Cybersecurity Advisory Committee and Standing Committee diversity metrics against targets

The following measurable short- and medium-term outcomes will be achieved in FY22:

- Development of an Equity, Diversity, and Inclusion statement shared with other DRI providers

- Development of CANARIE's EDI philosophy

- Development of CANARIE's equity, diversity, and inclusion action plan

- Comprehensive training for CANARIE and the NREN GC

- Compliance with the Board diversity policy

4 Program Delivery Timelines

Eligible Activities	Initiatives	Ongoing	Fiscal year 2021-22		
			Projected or *Actual* Launch	Major Milestones	Projected Completion
Network Operations					
Network Program	Operate the Network	▓			
	Increase capacity, redundancy, reliability - Milestone 2: Increased network capacity in western and eastern sections of the network, and also to NWT		*2020-04-01*	2021-12-17	2024-03-31
	Continue to enhance network security and measurement monitoring tools	▓			
	Continue to enhance user access to support tools - Milestone 2: Global networking map - Global map simple visualization		*2018-08-24*	2021-06-25	2022-03-31
	Continue to develop software-driven network services - Milestone 1: Software driven network operations tests (was automated lightpath tests) completed between an NREN Partner and CANARIE		2021-04-01	2022-03-26	2024-03-31
	Operate Distributed Denial of Service (DDoS) detection system - Milestone 2: Procedural coordination with NREN Partners on incidents		*2020-06-01*	2022-03-26	2024-03-31
	Provide sustainable cybersecurity monitoring service by efficiently managing and integrating the SIEM systems deployed on CANARIE infrastructure and network, and at each RAN location	▓			
	Operate the Distributed Denial of Service (DDoS) detection system dedicated to the CANARIE network and actively collaborate with NREN Partners	▓			
	Promote and implement in-house cybersecurity expertise development for CANARIE dedicated security staff and NREN security analyst community	▓			
IEP Program	Provide high-speed network connections to government research facilities	▓			
	Ensure connections are adequate to meet user needs	▓			
CAF Program	Promote the adoption of the eduroam Configuration Assistant Tool (CAT) profile to elevate the security posture of the entire eduroam community	▓			
	Development of more robust technical documentation and tutorials to simplify deployment, operation, and use of CAF services	▓			
	Expand the number of sites that broadcast eduroam wifi in the community - Milestone 1: Trial agreement		*2020-09-01*	2021-03-26	2024-03-31
	Research and development efforts focused on expanding identity services	▓			
Joint Security Program (CIP)	Continue to evolve the Joint Security Program (IDS) Milestone 2: Applications start for additional 70+ IDS participants		*2020-06-25*	2021-04-30	2024-03-31
	Continue to implement DNS Firewall initiative at eligible organizations.		*2020-11-01*	2020-11-01	2024-03-31
	Launch the Threat Feed initiative and begin implementation		2021-04-01	2022-03-31	2024-03-31
	Establish a sustainable framework to support cybersecurity initiative enablement through the NREN Partners		*2020-10-01*	2020-10-01	2024-03-31
	Work with the Measurement and Metrics Working Group (MM WG) to define a framework to assess the ongoing state of cybersecurity in the research and education sector		*2020-11-01*	2020-11-01	2022-03-31
	Launch additional cybersecurity funding initiatives based on the established Cybersecurity Advisory Committee - Milestone 3: Security initiative 4 launched		2021-02-01	2021-09-03	2024-03-31

NREN Program	Extend capacity, redundancy, reliability, and security through NREN Partner networks
	  - Milestone 3: NREN Competitive Call #2 project selection
	  - Milestone 4: NREN Competitive Call #2 projects start
			2021-04-01	2021-10-13
				2021-11-17
					2023-03-31

	Connect institutional facilities
	  - Milestone 3: NREN Competitive Call #2 project selection
	  - Milestone 4: NREN Competitive Call #2 projects start
			2021-04-01	2021-10-13
				2021-11-17
					2023-03-31

	Strengthen cybersecurity of the NREN
	  - Milestone 3: Consultations
	  - Milestone 4: Agreement on next initiative
			2019-11-28	2021-10-15
				2021-12-17
					2024-03-31

	Strengthen the NREN in the North - Milestone 2: 1st network connection with Nunavut regional network		*2019-08-28*	2022-03-26	2024-03-31

Eligible Activities	Initiatives	Ongoing	Projected or *Actual* Launch	Major Milestones	Projected Completion
Technology Innovation					
Research Software Program	Continue to promote the research software portal at science.canarie.ca	▓			2022-03-31
	Support and monitor funded projects in platform Call 3 in their maintenance phase - Milestone 3: Start of maintenance phase for projects		*2019-09-03*	2021-04-01	2023-03-31
	Support and monitor funded projects under the Local Research Software Support Call 1 - Milestone 2: Successful applicants selected; teams in place and funding starts		*2019-04-12*	*2020-06-01*	2023-03-31
	Technical and financial audits of projects in platform Call 3 and Local Research Software Support Call 1				2023-06-30
	Hold the 2021 Canadian Research Software Conference (CRSC)		2021-02-01		2021-05-16
	Support transition of activities to the new DRI organization at the end of FY22 - Milestone 3: Completion of Research Software position paper as part of NDRIO working group.		*2019-09-09*	2021-05-28	2022-03-31
Research Data Management	Community coordination in support of open science, policy creation, national standards, infrastructure and tools	▓			2022-03-31
	National engagement activities designed to facilitate the development and deployment of national data services that benefit all publicly funded research organizations - Milestone 2: Hold the 2022 National Data Services Framework Summit		2022-01-04	2022-03-16	2022-03-31
	Communication with international data infrastructure organizations to work towards compatibility and interoperability with international approaches	▓			2022-03-31
	Support and monitor funded projects under the Research Data Management Call 1 - Milestone 3: Halfway development point for selected projects		*2019-09-03*	2021-04-01	2022-03-31
	Technical and financial audits of funded projects	▓			2022-06-30
	Execution of activities in the RDC Roadmap to advance research data management priorities	▓			2022-03-31
	Support the transition of activities to the new DRI organization at the end of FY22 - Milestone 3: Completion of Research Data Management position paper as part of NDRIO working group. - Milestone 4: Completion of Research Data Storage position paper as part of NDRIO working group.		*2019-09-09*	2021-05-28 2021-05-28	2022-03-31
Innovation Fund	Support technology innovations and community needs defined during the mandate. - Milestone 1: Consultation complete with community on potential projects, and an initial project selected		2022-01-04	2021-12-17	2024-03-31
Private Sector Innovation					
DAIR Cloud Program	Operate the cloud platform (embracing updates to the platform core technologies as necessary	▓			
	Enhance technical capabilities of the DAIR cloud infrastructure with features to help users reduce time to market	▓			
	Create and publish educational content related to efficient and secure use of cloud resources and services	▓			
	Create a community forum for the information exchange between private sector innovators - Milestone 2: Promote moderated slack channel		*2019-10-18*	2021-09-01	2024-03-31
	Evolve the DAIR BoosterPack pilot project, which utilized a new hybrid cloud environment leveraging private sector investment in Canadian cloud infrastructure/services, and deliver BoosterPack training materials with source code developed by Canadian SMEs - Milestone 3: Continous call for additional BoosterPacks from SMEs - Milestone 4: Additional BoosterPacks available from SMEs		*2019-01-06*	2021-02-01 2021-08-28	2024-03-31
	Cultivate strategic partnerships to add value for the DAIR user community, contributing toward the evolution of a consolidated cloud service - Milestone 3: Formalize SME referral program between CENGN and DAIR		*2019-12-11*	2021-09-01	2024-03-31
CENGN Network Testbed	Ensure network connectivity and related support for CENGN test bed initiative	▓			

5 Representation and Financial Plan

The Government of Canada has invested $137M to support CANARIE's activities from 2020-2024. This funding commitment ensures that CANARIE can continue to deliver strategic investments in infrastructure and services for Canada's research and innovation communities. CANARIE has identified a cash flow requirement of $28.7 million for the FY22 funding year.

CANARIE covenants and agrees to hold, invest, administer, and disburse that amount in accordance with the stipulations of the Contribution Agreement. No interest or investment income is payable by the Minister on the funds to be provided.

5.1 Program Revenues and Expenses

The following table summarizes CANARIE's program revenue and expenses projections for the FY22 fiscal year.

	FY22 (in 000s)
REVENUES	
FUNDING	
Government of Canada	28,700
TOTAL FUNDING	**28,700**
PROGRAM REVENUES	
User Fees	611
Interest Income	70
TOTAL PROGRAM REVENUES	**681**
TOTAL REVENUES	**29,381**
EXPENSES	
PROGRAM EXPENSES	
Network Operations	
Network Infrastructure & Services	11,532
Network Security	835
Joint Security Project (CIP)	5,939
NREN	3,015
Technology Innovation	
Research Software	3,169
Research Data Management	1,158
Research Data Canada	417
Innovation Fund	-
Private Sector Innovation	
DAIR	1,884
CENGN	20
TOTAL PROGRAM EXPENSES	**27,969**
Administrative Costs	4,991
TOTAL EXPENSES	**32,960**
EXCESS OF EXPENSES OVER REVENUES	**(3,579)**

CANARIE is projecting underspending in administrative costs as well as from the RS, RDM, and RDC programs. The administrative costs underspending will be re-allocated to Network Operations and the programs underspending will be re-allocated to the Innovation Fund. The re-allocations will be reflected in **FY23 and FY24.**

5.2   Funding Requirements

As indicated in the Program Revenues and Expenses shown above in Section 5.1, CANARIE's cash requirement for FY22 (the second year of CANARIE's 2020-2024 mandate) is $28.7M.

5.3   Representation

CANARIE Inc. represents that it is not in default under the terms of the Contribution Agreement that is currently in force.

5.4   Cost Recovery

The following table summarizes CANARIE's cost recovery projections for FY22.

	FY22 (in 000s)
CASH	
IEP User Fees - Federal	100
IEP User Fees - Non-federal	6
Participant Fees	505
TOTAL CASH	**611**
MATCHING FUNDS	
NREN	796
DAIR	19
TOTAL MATCHING FUNDS	**815**
TOTAL COST RECOVERY	**1,426**

Throughout FY22, CANARIE will continue to charge fees to users of CANARIE services and programs.

- As part of the legacy infrastructure extension program (IEP), CANARIE supports the costs to connect federal and non-federal labs to the NREN. The federal IEP connections' cost recovery is a fixed annual amount paid by Shared Services Canada to offset the total annual cost of supporting these connections. For non-federal IEP connections, the amount in the budget represents 100% cost recovery of planned expenditures.

- Participant Fees include the cost recovery for the CAF program and other Network program initiatives.

- The NREN program will result in sharing of costs between CANARIE and other funding sources (e.g., provincial government, NREN partner funds, etc.) for funded projects. CANARIE's contribution level will be determined on a project-by-project basis. CANARIE will ensure the outcome of the NREN program meets its overall cost recovery target, hence, greater priority will be given to projects which have leveraged contributions.

- The DAIR program expects to realize matching funds from its funded project.

5.5 Investment Policy and Strategy

CANARIE shall continue to invest and manage any advanced funds according to investment policies, standards, and procedures that a prudent person would follow in making investment decisions regarding property belonging to others. CANARIE will manage the funds in accordance with the Contribution Agreement and, the investment directives contained in Article IV of the Contribution Agreement. The objectives 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 Policy and Investment Strategy adopted by CANARIE. Investment decisions shall be made with the principal objective being the preservation of capital to meet future disbursement requirements.

The Investment Policy and the Investment Strategy specify permitted transactions and risk limitations for all market and credit risks faced by CANARIE, and levels of authority of officials who can commit CANARIE to different types of transactions. The Investment Policy and Investment Strategy must be reviewed annually: they were most recently reviewed and approved by the Audit and Investment Committee in October 2020. The Investment Policy is guided by the constraints contained in the Contribution Agreement.

6 Performance Monitoring Strategies, Risk Assessment, and Mitigation Strategies

Performance Monitoring Strategies

CANARIE collects metrics internally for all its programs, services, and for the network. External performance metrics are collected from the community in the form of user surveys, reports and reporting from the regional networks. CANARIE works with the Minister to integrate this information as part of an overall performance management strategy. Additionally, performance data for each eligible activity is part of CANARIE's annual reporting.

Program Delivery Risks

Due to the diversity and complexity of the ecosystem CANARIE operates in, risk management is essential for CANARIE to achieve the expected results defined in the Contribution Agreement. Risk is reported on by Management and monitored by the Board of Directors.

Identified risks are classified based on the likelihood of occurrence of the risk, as well as the severity of the negative impact of the risk. The treatment of identified risks will vary based on these two dimensions as per the table below:

		Probability		
		Low	**Medium**	**High**
Impact	**Low**	Accept risks	Accept risks with monitoring	Monitor and manage risks
	Medium	Accept risks with monitoring	Develop formal risk mitigation measures	Develop formal risk mitigation plan
	High	Identify mitigation steps and monitor regularly	Develop formal risk mitigation measures and monitor regularly	Develop formal risk mitigation plan and monitor regularly

Please see Table below:

Risk Name	Description	Prob.	Impact	Risk	Mitigation Strategies and Action Plans
Transition Risk	The Contribution Agreement includes a completion date for the transition of relevant CANARIE programs to NDRIO, and there are external risks which could lead to a failure to complete the transition prior to the specified deadline	M	H	MH	• Working with ISED, NDRIO, and the community to support the development of a fully functional new organization • C.A. requirements for Transition Plan (completed) and annual Joint Ecosystem Plan and Ecosystem Report. • Meetings are on-going with NDRIO. Relationships with the President, and other key staff at NDRIO, continue to develop and work is on-going.
Network Operations Risks	Possibility that CANARIE is unable to find, or find at appropriate cost, fibre for certain network upgrades. Among other things, this would make CANARIE less agile in responding to the needs of the research community, as well as facing ever-growing network costs by using a growing number of leased wavelength services	M	M	MM	• Establish and maintain senior level relationships with fibre and equipment providers • Engage Board and advisory committee members, where appropriate, to work within their organizations to support this initiative • Work with international community on key international routes. • Continued identification of fibre suppliers
Cybersecurity Initiatives Program	Risk that the program will not have the desired uptake or adoption	M	M	MM	• Align the community on a common framework to work together on securing the R&E community • Develop infrastructure and capacity in the system to enable rapid adoption of new initiatives • Develop and implement key measures to demonstrate value to both funders and eligible organizations
Technology changes occurring mid-mandate	Given the length of CANARIE's mandate vs the pace of technological change, it is likely that new technologies or services arise that CANARIE has not budgeted for in the normal multi-year cycle	M	M	MM	• Budget flexibility • The intent of Innovation Fund is to support new technologies and newly identified needs in the community • Board oversight on Operating Plan and Program changes and evolution
RDM Alignment	Possible failure of the broader research and education community to align on tools and services within a National Data Services Framework	M	L	ML	• Engage with the RDM personnel and software developers • Engagement with the Research Data Management Advisory Committee • Strengthen partnerships with other organizations involved in RDM

RDC Alignment	Risk that the stakeholder community remains fragmented, with limited alignment on ensuring data reuse	M	L	ML	• Use of RDC Working Groups to encourage alignment • Continued advocacy and engagement with the broader RDM community • Advocacy for international best practices within Canada
DAIR Service Relevance	Risk that DAIR will not evolve to offer new services that are critical to the changing needs of the ICT sector, SMEs in particular and, therefore, becomes less relevant	L	H	LH	• Development of DAIR 2.0 (BoosterPacks) to ensure relevant service offering • Continuous interactions with SMEs and commercialization-supporting organizations • Marketing outreach to increase awareness of DAIR • Working with other organizations that support SMEs to develop a consolidated offering • Assess the utility of the service via user surveys and performance metrics
Failure of key international partner	The failure of key international NREN (e.g. Internet2, GEANT, AARNet etc.) would both limit CANARIE's ability to provide service, and weaken our value proposition	L	H	LH	• Maintain strong relationships with international partners to create mutual support • Work with the international community on common initiatives that demonstrate value of the GREN
Service Delivery via NREN Partners	Should one or more NREN partners start to have objectives that are not aligned with CANARIE's, it could impact, or impede, CANARIE's ability to deliver on its own mandate	L	H	LH	• Ongoing support for the NREN Governance Committee, comprised of CANARIE and NREN Partner presidents • Implementation of the NREN Strategic Plan to identity NREN priorities • Ensure program funding to the NREN Partners is structured in a manner to assist in attaining NREN objectives that also support CANARIE's network objectives • Ensure NREN Partners are represented by a CANARIE Board member
Research Software Uptake	Possible low adoption of software development approach by the broader R&E community	L	H	LH	• Engage with the R/S community • Engagement with the Research Advisory Committee • Strengthen partnerships with other R/S funders
JSP Alignment	Risk that participants in the JSP fail to collaborate in a meaningful way – e.g. on data sharing agreements – or that participants drop out due to lack of alignment	L	H	LH	• Signing up to the JSP Call demonstrates willingness to collaborate • Experience with the pilot will allow CANARIE to steer discussions to encourage alignment