



STAKEHOLDER CONSULTATION for the Renewal
and Modernization of the Applications
Development Activity

Challenge Paper

Énoncé des enjeux

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INNOVATION
EXPLORATION
OBSERVATION
INSPIRATION



Agence spatiale
canadienne

Canadian Space
Agency

Canada



Seeking Input on a Proposed *Applications Development Activity*

The Canadian Space Agency (CSA) is in the process of modernizing its space applications development activities. The new *Applications Development Activity* (the *Activity*) is a concept for addressing an increasingly important need to redesign the approach to accelerating innovation in the delivery of space based applications targeting the issues and priorities important to Canada's future success. It will involve the creation of an appropriate and flexible framework to effectively encourage and support the realization of innovative concepts into operational and commercial products and services.

The ultimate goal is for stakeholders in the space domain, including governments, industry and academia, to build applications meeting the needs of Canadians, and the development of a competitive value-added space economy based on collaborative initiatives and shared resources.

The *Challenge Dialogue* on the *Activity* Concept is focused on four primary outcomes:

1. **Build understanding:** There is an increased understanding:

a. By CSA stakeholders of the CSA's intentions to modernize services to better support their needs and expectations through the renewal of the *Activity*.

b. By the CSA of the needs and expectation of its clients and stakeholders (Governments, Industry, Academia, Non-Governmental Organizations (NGO) and downstream Clients) to inform the renewed design of the *Activity*.

2. **Shape a vision:** A renewed vision for the Earth Observation and Utilization (EOAU) Division for the future.

3. **Propose a well-informed renewal:** A renewed design of CSA's *Activity* that:

a. Addresses the full range of Application Readiness Levels with integrated and coordinated funding mechanisms, flexible partnerships, and international trade and export agreements;

b. Supports the integration of space technologies and data at the intersection of non-space systems and data for increased utility of space products and services;

c. Builds best of breed skills and capabilities in Canada to launch broad-based commercialization and new international program leadership; and,

d. Supports a policy environment that encourages open access and use of data for shared applications development and research collaboration.

4. **Develop recommendations:** Design recommendations are made for a *Strategic Applications Framework* for a renewed *Activity*.

Note: On the following pages, you will be asked to respond and contribute to this *Challenge Paper*.



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CHALLENGE PAPER

1 Key Challenge

To engage a broad range of CSA clients and stakeholders to seek their views on how the Applications Development Activity (the *Activity*), under the CSA's Space Utilization program (SUP), can be renewed to better help grow Canada's space economy.

2 Purpose of the *Challenge Paper*

The purpose of this *Challenge Paper* is to inform and frame a meaningful online conversation on the Key Challenge above with CSA's clients and stakeholders (Governments, Industry, Academia, and NGO) who work with space technologies and space data. This online *Challenge Dialogue* will inform a face-to-face meeting of selected stakeholders at a *National Forum on Earth Observation* to be held at CSA in September 2018.

At various points in the paper you will be asked for your reaction and further input. Please try to provide your feedback online at <https://www.surveymonkey.com/r/CSAConsultation> by **August 3, 2018**.

The *Challenge Dialogue* is launched with the distribution of this *Challenge Paper*. It is not meant to serve as a definitive or complete document on the *Key Challenge*. Rather, it is to serve as a catalyst for initiating this important consultation initiative. The Appendix provides an overview of the *Challenge Dialogue* process, one of several applications of the *Challenge Dialogue System*® (CDS).

3 Background and Events that have led to this Key Challenge

3.1 Key drivers for this Dialogue

1. The main driver for this Dialogue is the need and opportunity for Canada to rethink and redesign its approach to accelerating innovations in the space applications domain. Building on what has worked well; this will require modernizing CSA's programs and



practices to a renewed vision of the future. To facilitate this change, the primary goal is to design an applications development activity framework based strongly on collaborative initiatives, current best practices, and greater resource sharing.

2. The space applications environment requires a more flexible and scalable approach to meet stakeholder needs and CSA's SUP goals more effectively. Following are some key criteria to guide this effort:
 - a. Adopt "whole of government" and "top-down" approaches to deliver on key national priorities by strengthening the linkages and relationships between CSA applications development activities and other government programs (e.g., GeoConnections, DND programs, IRAP and others).
 - b. Respond to issues that have been identified in recent studies that reviewed CSA's SUP as described in Section 3.2 *Events leading up to the renewal and modernization imperative*.
 - c. Examine the *Activity* opportunities for greater integration of space technologies for the development of downstream applications in combination with non-space applications.
 - d. Strengthen interdisciplinary partnerships with government, industry and academia to ensure that the "best minds are at work" on priority challenges and opportunities.
 - e. Design a regular and synchronized calendar for requesting proposals so that submissions can be well-coordinate and of highest quality.
3. Funding is provided by CSA¹ either directly for Applications Development Activities or for support of these activities. The funding is in the form of grants, contributions or contracts described as follows:
 - a. **Government Related Initiatives Program (GRIP)** is an Earth Observation (EO) capacity building and enhancement program. Its goal is to foster the use of Canada's space resources to support the mandates of Canadian federal government departments. In partnership with other departments and agencies, GRIP supports research, development, demonstration, and implementation of EO technology. Its aim is to help provide information on the environment, natural resources, and security and to develop capacity for the use of EO technologies in the Government of Canada.

¹ If you wish to learn more about the Canadian Space Agency activities in Earth observation and applications, please visit <http://asc-csa.gc.ca/eng/satellites/default-eo.asp>.



- b. **Earth Observation Applications Development Program (EOADP)** EOADP's aim is to stimulate and maintain a self-sustaining, innovative, growing Canadian space industry able to respond to mainstream commercialization opportunities and to service user needs nationally and internationally. EOADP is essential for the exploitation of CSA supported EO missions through the development of Canadian EO and space related private sector capabilities. The program also prepares the industry to take advantage of CSA investments in new sensors.
 - c. **Science and Operational Applications Research (SOAR)** The SOAR program provides academic stakeholders with an opportunity to study the enhanced capabilities of RADARSAT-2 and their potential contribution to applications. SOAR support consists of a loan of a limited amounts of RADARSAT-2 data for research. SOAR is operated as a partnership between MacDonald Dettwiler and Associates Ltd, Geospatial Services Inc., and the Canadian Government through CSA and the Natural Resources Canada's Centre for Remote Sensing. RADARSAT-2 is being phased out and replaced by the RADARSAT Constellation mission.
- 4. Current government acts, regulations, and policies support the need for a renewed applications development activity for climate change, water, natural disasters, etc. to better inform “whole of government” challenges. This approach also better leverages multiple sources of development funding.
- 5. “New Space” refers to a new paradigm in the space industry where new business models and engineering approaches disrupt existing markets with cheaper, faster and/or new services. The space sector is evolving from “old space” to “new space” business models. The downstream space market in this model is characterized by users who are not always satellite or space specialists. They simply want information solutions regardless of the data sources or technologies involved. Traditional space programs are being complemented by fast-growing new space developments and activities. The renewed Applications Development Activity needs to consider how best to support these new users
- 6. “Big data analytics” refers to the analysis of large volumes of data from a wide variety of sources, including multiple satellite systems, *in situ* sensors, Machine to Machine (M2M) interaction, social networks, videos, digital image libraries, data archives, etc. Big data analytics are becoming increasingly important in prediction and decision making, along with machine learning and artificial intelligence (AI) methods.
- 7. The integration of data and technologies into customer-specific “information solutions” is a growth segment for the SATCOM, GNSS, S-AIS and EO markets. Users typically have



limited training in the use of these technologies and are less interested in becoming experts in the development of information products. Demand for the integration of SATCOM, GNSS, S-AIS and EO technologies is emerging in several market niches such as disaster management, Location Based Services (LBS), Business-to-Consumer (B2C), and in the environmental sector, coastal zone monitoring and environmental information products and services for polar regions.

8. Issues related to data access and costs vary widely around the world by organization and national programs. For example, certain types of data may have safety and security implications that restrict data access in specific regions during particular seasons. Costs of data range from no charge, as with GPS signals, to high costs, as with processed EO imagery. Data access and costs have major effects on the use of data for distinct applications by individual users.
9. There is an advantage to continue building on the CSA's principles and mandate:
 - a. **Commitment:** Longstanding commitment to the development of advanced space applications as a foundation to respond to Canada's ongoing and emerging data and applications needs including the integration of new and complementary technologies in the marketplace.
 - b. **Collaboration:** Strong collaborative relationships across sectors that provide the basis for continued innovation.
 - c. **Cooperation:** International relationships that continue to open up new opportunities for discovery, innovation and applications.

3.2 Events leading up to the renewal and modernization imperative

1. The renewal of the Space Utilization Directorate's Applications Development Activity² aims to support and directly align with:
 - a. CSA's programmatic and governance framework
 - b. CSA's Departmental Results Framework
 - c. Innovation, Science and Economic Development (ISED) priorities
 - d. the Outcomes of two CSA Programs; including the SUP and the Space Capacity Development Program (SCDP)
2. On February 7, 2014, Canada's Space Policy Framework³ established future priorities for space. The Framework builds on the following principles that reflect CSA's leadership

² Departmental Plans (Reports on Plans and Priorities): <http://www.asc-csa.gc.ca/eng/publications/dp-2018-2019.asp>

³ Canada Space Policy Framework: <http://www.asc-csa.gc.ca/eng/publications/space-policy/default.asp>



role in the space sector, its partnerships with industry and academia, and its intentions to help grow the sector and unlock further benefits from space:

- a. Canadian interests first
- b. Positioning the private sector at the forefront of space activities
- c. Progress through partnerships
- d. Excellence in key capabilities
- e. Inspiring Canadians

The areas for action include:

- a. Commercialization
- b. Research and Development
- c. Exploration of Space

3. The Space Advisory Board⁴ was tasked by the Minister of ISED to consult with stakeholders on a new space strategy and report its findings. In August 2017 the Board provided advice to “Designate Space as a National Strategic Asset” to ensure that:
 - a. the country (governments, industry, academia, and civil society) focuses on the importance of space to Canada’s economic and social growth;
 - b. a whole-of-government approach is taken in the development and management of the national space program;
 - c. the regulatory and procurement regimes support commercialization and export of space technologies;
 - d. Canada has the capacity to develop and use space to meet national needs; and
 - e. Canada has the specialized human resources required by government, industry, and academia to conduct space activities.
4. The July 2017 Audit of the Earth Observation Business Line (EOBL) made the following key recommendations:
 - a. The CSA should seize the opportunity to review its EO program outcomes in order to appropriately reflect the range of stakeholders in Canada and respond to their needs by providing access to a variety of EO data, including data from foreign satellites.
 - b. The CSA should enhance the effectiveness of the applications program by reviewing its design and funding options to better support building EO data departmental user capacity and developing a competitive EO value-added industry in Canada.
5. Budget 2017 announced Canada’s Innovation and Skills Plan⁵ stating — “To lead the world in innovation, we need to equip Canada’s workers with the tools they’ll need to succeed in the new economy.” The effective delivery of space-based, integrated solutions is an integral part of that success.

⁴ Space Advisory Board Report on consultations: https://www.ic.gc.ca/eic/site/ad-ad.nsf/eng/h_ad03983.html

⁵ Innovation and Skills Plan: <http://www.ic.gc.ca/eic/site/062.nsf/eng/home>



6. The importance of space-based technologies to further Canada's long-term economic prosperity, particularly in northern communities, is recognized as a key driver for the forthcoming Arctic Policy Framework and the National Space strategy.

PLEASE PROVIDE YOUR FEEDBACK ONLINE TO THE KEY CHALLENGE AND BACKGROUND TOPICS

- ▶ What questions or aspects do you wish to raise about the Key Challenge?
- ▶ What did our challenge statement spark in your mind?
- ▶ What critical information or perspectives on the Background and topics are of particular concern to you?
- ▶ Are there any other issues or events that you feel should be added?

4 Expected Outcomes of this Challenge Dialogue

This Challenge Dialogue is being championed to achieve the following expected outcomes:

1. **Build understanding:** There is an increased understanding:
 - a. By CSA stakeholders of the CSA's intentions to modernize services to better support their needs and expectations through the renewal of the *Activity*.
 - b. By the CSA of the needs and expectation of its clients and stakeholders (Governments, Industry, Academia, Non-Profit organizations and downstream Clients) to inform the renewed design of the *Activity*.
2. **Shape a vision:** A renewed vision for the Earth Observation and Utilization (EOAU) Division for the future.
3. **Propose a well-informed renewal:** A renewed design of CSA's *Activity* that:
 - a. Addresses the full range of Application Readiness Levels with integrated and coordinated funding mechanisms, flexible partnerships and international trade and export agreements;
 - b. Supports the integration of space technologies and data at the intersection of non-space systems and data for increased utility of space products and services;
 - c. Builds best of breed skills and capabilities in Canada to launch broad-based commercialization and new international program leadership; and,
 - d. Supports a policy environment that encourages open access and use of data for shared applications development and research collaboration.



4. **Develop recommendations:** Design recommendations are made for a *Strategic Applications Framework* for a renewed Applications Development Activity.

PLEASE PROVIDE YOUR FEEDBACK ONLINE ON EXPECTED OUTCOMES

- What reactions, questions or suggestions do you have to make with regard to the expected outcomes?

5 Assumptions Driving this Challenge Dialogue

1. **The capacity of organizations to exploit satellite technologies is generally increasing**, although some satellite technologies require extensive specialist training and equipment to be able to utilize it fully.
 - a. Federal government departments are using space-based EO, Satellite Communications and Positioning technologies widely, although there remains substantial room for new uses and applications. Fortunately, this expansion of uses does not require a huge outlay of new funds.
 - b. Provincial governments differ widely in their capacity to use satellite technologies. The main area of application is for inventory and natural resource management, and disaster management.
 - c. Municipal governments use Positioning and Satellite Communications technologies but are relatively inexperienced in the use of EO technologies outside of major centres.
 - d. The private sector, particularly GIS based companies, has a wide range of experience and success in using EO technologies to respond to client needs.
 - e. The non-profit sector, especially environmental groups, has a wide range of experience and success in employing EO technologies to support their work.
 - f. Free access to RADARSAT data for research and testing has promoted its use for research in the academic sector and for training of highly qualified personnel.
2. **“New Space” development** is driven largely by the private sector. Advances in the economics of building, launching, and operating spacecraft is opening the door to new and lucrative commercial activities and new partnership opportunities between government and industry. It also is an important example of the integration of space technologies and data into non-space systems and services.
3. **The next generation of space systems** will differ greatly in terms of their functions, performance, and costs from those currently in operation. To remain competitive and to



reap the performance benefits that these advances will bring, Canada must continue to invest in research that underpins this direction.

4. **A whole-of-government approach**, which acknowledges space as a sector of strategic importance to all government departments, is essential for enabling Canada's sovereignty and security agenda, as well as growing other parts of Canada's economy. The space sector today is recognized for its high strategic value and needs to be sustained and expanded.
5. **Outreach and education programs** involving Canadians of all ages in the Canadian space program will encourage youth to pursue careers in space-related sciences and technology.
6. **There is growing demand for the use of archived space imagery** to meet the needs of governments, industry and academia for conventional applications as well as for stimulating retrospective researches and innovative applications.
7. **Applications development support** needs to be continuously improved so they remain relevant to market trends and growth opportunities, particularly if Canada aims to maximize the potential of the space sector for governments, Canadian companies, non-profits, and academia.
8. **There is a need for Canada's space sector to support the full range of application readiness levels (ARLs)** under a set of integrated and well-coordinated funding mechanisms.
9. **Leveraged funding** opportunities can provide greater use of multi-funding sources, including national or international partnerships, that will help to accelerate space applications development efforts.
10. **Canada continues to have a strong foundation to drive and support space applications development for the benefit of all Canadians.** It can leverage:
 - a. CSA's commitment and longstanding support for the development of advanced space applications will drive future applications activities to address Canada's emerging needs while also integrating complementary technologies in the marketplace.
 - b. CSA's well established collaborative relationships across many sectors in Canada and internationally provide a strong basis from which to develop new initiatives.



PLEASE PROVIDE YOUR FEEDBACK ONLINE ON THE ASSUMPTIONS

- Participants are invited to react to the above assumptions – challenging those with which they may disagree and suggesting others. What reactions, questions or suggestions do you have to make with regard to the above Assumptions?

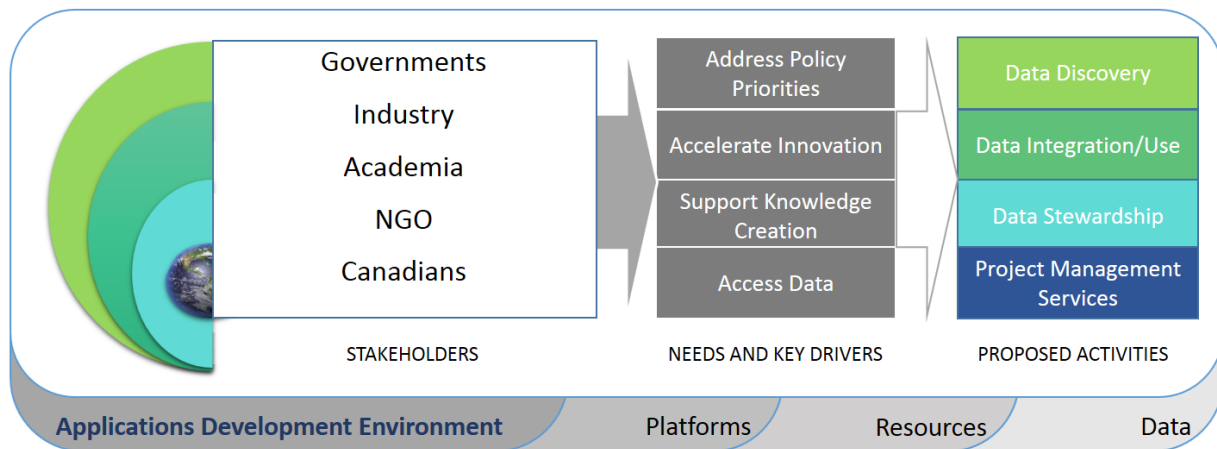
6 New Frontiers

This section begins with a description of the *Activity* concept being considered by the CSA for the design of a space data applications development Framework. The figure below illustrates the main components of the concept. This is followed by a set of questions to help shape and move forward with the *Activity* concept.

6.1 The *Activity* Concept

In re-thinking its approach to applications development activities, the CSA is advancing the concept of a new Applications Development Activity (the *Activity*). This is centered on the intention of accelerating innovation in the delivery of new or improved space-based applications to respond more quickly and creatively to opportunities, challenges, and priorities important to Canada. The concept is portrayed and organized using a Strategic Applications Framework to support the design, development, and delivery of innovative ideas into operational and commercial products.

The ultimate goal is for stakeholders in the space domain – governments, industry and academia – to develop an *Activity* concept that meets the needs of Canadians while also growing a more competitive value-added space industry. Critical success factors for this new direction are collaboration, resource sharing, and innovation.



The figure above illustrates the *Activity* concept as a series of supporting layers. It portrays a holistic applications development framework and environment driven by collaborative innovation and shared resources addressing the opportunities, challenges, and priorities important to Canada.

The *Applications Development Activity Framework* shows four layers. From top to bottom they are: Stakeholders, Needs and Key Drivers, Proposed Activities, and Applications Development Environment.

Stakeholders: Downstream clients or users of space-based solutions in the form of applications incorporating space technologies including Earth Observation data from space, Satellite Communications or Global Positioning services. The stakeholders include **Government agencies** (federal, provincial and territorial), **Industry**, **Academia**, **Non-government organizations** and **Canadians**.

Needs and Key Drivers: The *Activity* concept will deliver space-based solutions that address the application needs and priorities of stakeholders working on opportunities and challenges important to Canada. The key drivers are captured as **Accelerate Innovation** with a focus on delivering commercial products and services; **Address Policy Priorities** of governments; **Support Knowledge Creation** by supporting research and development; and supporting **Access to Data** both nationally and internationally.



Proposed Activities: Activities that are supported will utilize a set of basic functions to deliver space-based solutions. They include:

- **Data Discovery** to find and access data sets both nationally and internationally;
- **Data Integration** to bring the data sets into a standard model/format for analysis;
- **Data Use** to model the data in terms of specific scenarios;
- **Data Stewardship** to ensure issues concerning both data definition and data ownership are appropriately managed; and,
- **Project Management Services**, which include all of the tools, protocols and agreements to address planning, investment, reporting and outreach activities in a cooperative shared resources environment.

Applications Development Environment: Supporting the applications are the space **Platforms** or technologies (EO, SATCOM, GNSS, S-AIS), the **Data** (EO, real time *in-situ*, field survey, inventory, etc.) and other **Resources**, including technical support staff.

6.2 Critical questions as we consider renewal of the Activity

The following questions are focused on the *Activity* concept outlined above. Please respond to as many of the questions as possible.

1. **Stakeholders:** Which group do you identify with? How is that group currently involved in Applications Development? Are you able to identify one or two changes to the current Development Environment that would improve its value?
2. **Needs and Key Drivers:** Do you agree with this list of Needs and Key Drivers for setting priorities for the development of applications? Which one is most important and why? Are any key ones missing?
3. **Proposed Activities:** What are some of the **Strengths** and **Weaknesses** of the current CSA applications development programs (i.e. EOADP, GRIP and SOAR)? How might these be improved to reflect a government, industry and academic partnership approach to applications development and the delivery of space-based solutions?
4. **Applications Development Environment:** What aspects of the current applications development environment offer the most significant opportunities, and where are the “road blocks” to the integration of space technologies and data for development of downstream applications?



5. **Do you have any further suggestions** regarding the *Activity* concept?
6. **Which of the following innovation roles should the CSA consider** as *mandatory*, *highly desirable*, *desirable* or *not required* (not relevant) when re-designing its Applications Development Activity?
- a. **Enabler** – To support individuals and organizations that seek to make innovation easier—or in some cases possible—by providing essential resources such as training, data and funding.
 - b. **Motivator** – To support individuals or organizations to innovate by providing incentives. – e.g. Incentives can include rewards, prizes, recognition, or policies and regulation.
 - c. **Convener** – To support individuals and organizations in the innovation ecosystem to come together to share knowledge and resources or to partner to solve challenges. - e.g. by supporting conferences, workshops, establishing wikis, etc.
 - d. **Integrator** – To support individuals and organizations to identify and form groups who can further connect and partner with each other and create opportunities to collaborate. - e.g. supporting labs, technology centres, sharing of data, technologies or resources, etc.
7. **Does a more whole-systems and collaborative approach** to applications development based on identifying a shared purpose, defining collaborative opportunities, which may include the sharing of resources, make sense? Is such an approach advantageous for making best use of our space platforms and technologies (EO, SATCOM, GNSS, S-AIS) for creating and delivering innovative space-based solutions to Canada's most pressing challenges?
8. **Are there any particular program design elements you believe need more attention**, such as types of agreements, funding levels, application request processes, partnerships, domains of interest, etc.? What elements should not be changed?

PLEASE PROVIDE YOUR FEEDBACK ONLINE WITH YOUR REACTIONS TO SOME OR ALL OF THESE CRITICAL QUESTIONS.



7 Immediate Next Steps

1. Participants are requested to note their reactions to some or all of the questions in this Challenge Paper. Please try to provide your feedback online at <https://www.surveymonkey.com/r/CSAConsultation> by **August 3, 2018**.
2. The Organizing Team will synthesize the input from participants and use it as a base for supporting a dialogue at the *National Forum on Earth Observation* to be held at CSA in September 2018.

Many thanks for your anticipated contribution!



8 Appendix – The Challenge Dialogue System® (CDS)

CDS is an efficient and effective vehicle for engaging diverse stakeholders and assisting them to collaborate and innovate in order to accomplish a complex task. CDS is a structured but flexible methodology for moving a team from ideas to action quickly and effectively. For more information on CDS please see <http://www.challengedialoguesystem.net/the-challenge-dialogue-system/>.

