An SKA Regional Centre in Canada

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Canadian Astronomy Data Centre

Herzberg Astronomy and Astrophysics

Canadian SRC strategy

Develop a functional pre-cursor regional centre

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  - Develop the tools and infrastructure needed to evolve towards an SKA-scale regional centre
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- Supporting large-data projects is not seen as radio astronomy-specific problem

A Canadian SKA Regional Centre

Possible Functions/Activities

- Science archiving
- User support
- User workflow infrastructure
- Project collaboration infrastructure
- Processing and storage
- Interoperability infrastructure
- Algorithm development
- Pipeline development
- Infrastructure software development
- Education and outreach

A Collaboration/Partnership

- The building blocks already exist:
  - University teams
  - National Research Council
  - Canadian Astronomy Data Centre
  - Canadian Advanced Network for Astronomical Research
  - Compute Canada
  - CANARIE
- CFI Innovation Fund
- CFI Cyberinfrastructure Fund

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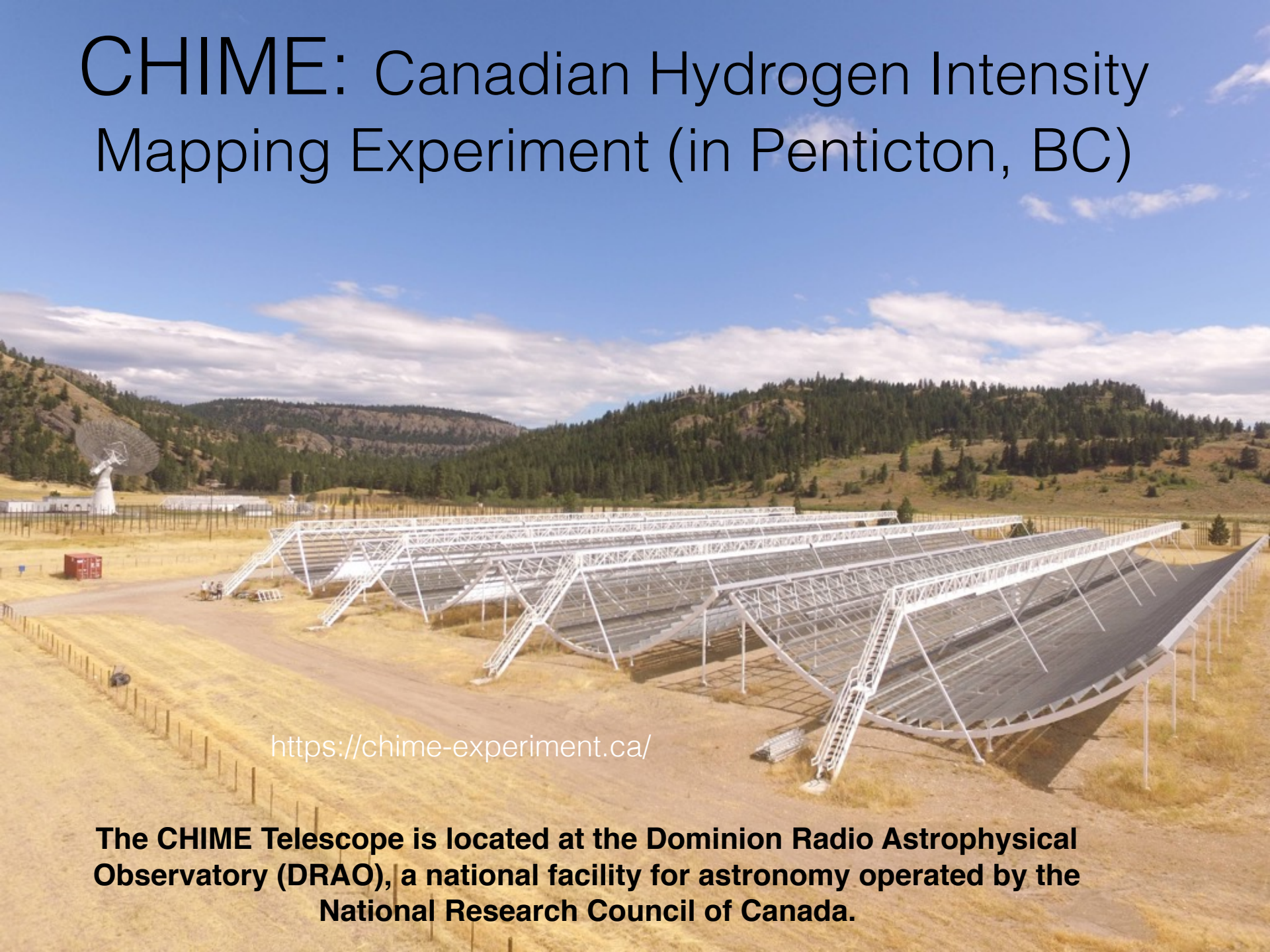
Unlocking the Radio Sky with Next-Generation Survey Astronomy

- Successful $9.4M (€6.3M) CFI Innovation Fund proposal (PI: Brian Gaensler)
- *Development of this infrastructure will also allow us to train the next generation of Canadian physicists, software developers and data scientists, and will establish the capacity needed to host the Canadian SKA Data Centre*

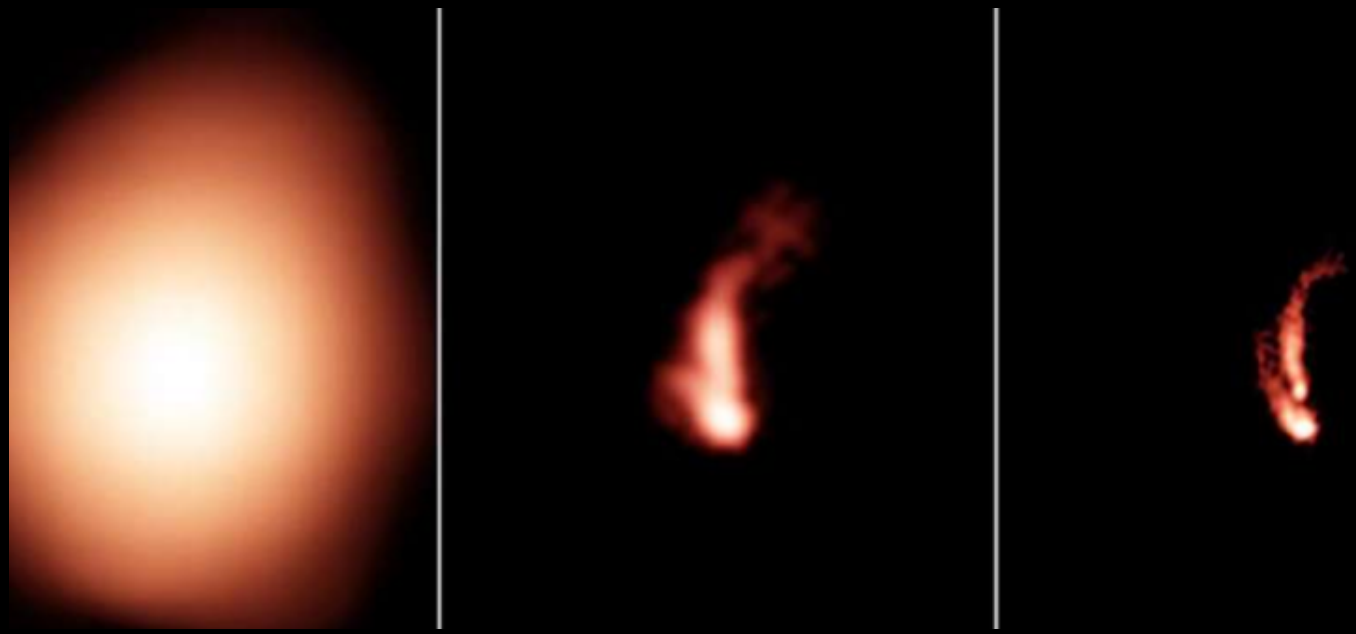
Unlocking the Radio Sky with Next-Generation Survey Astronomy

CHIME: Canadian Hydrogen Intensity Mapping Experiment (in Penticton, BC)



The CHIME Telescope is located at the Dominion Radio Astrophysical Observatory (DRAO), a national facility for astronomy operated by the National Research Council of Canada.

VLA Sky Survey (VLASS)



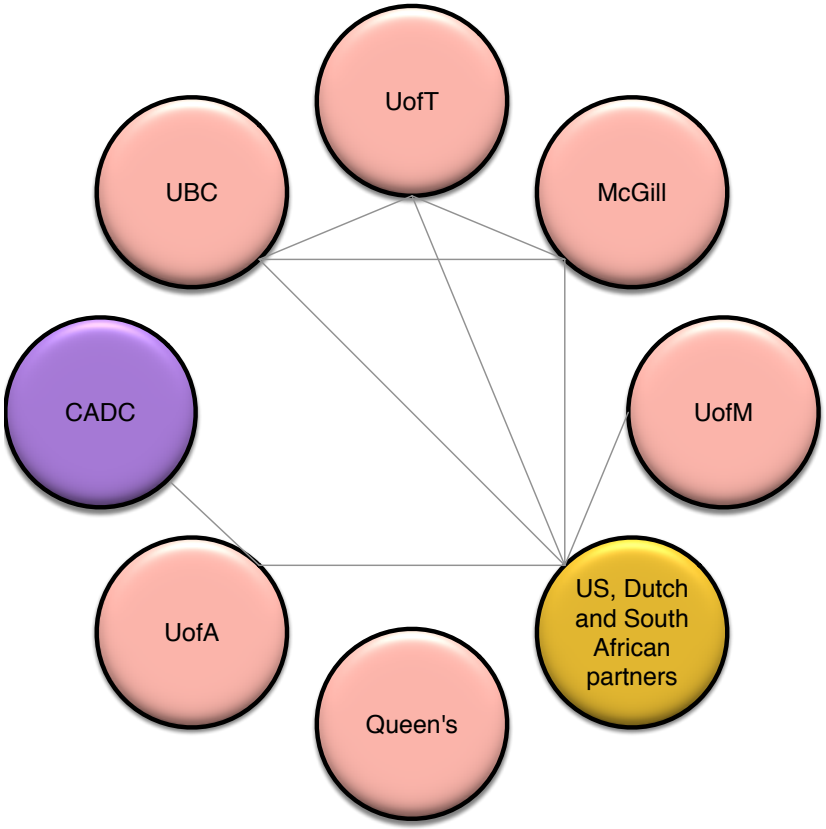
Project started Sep 2017!

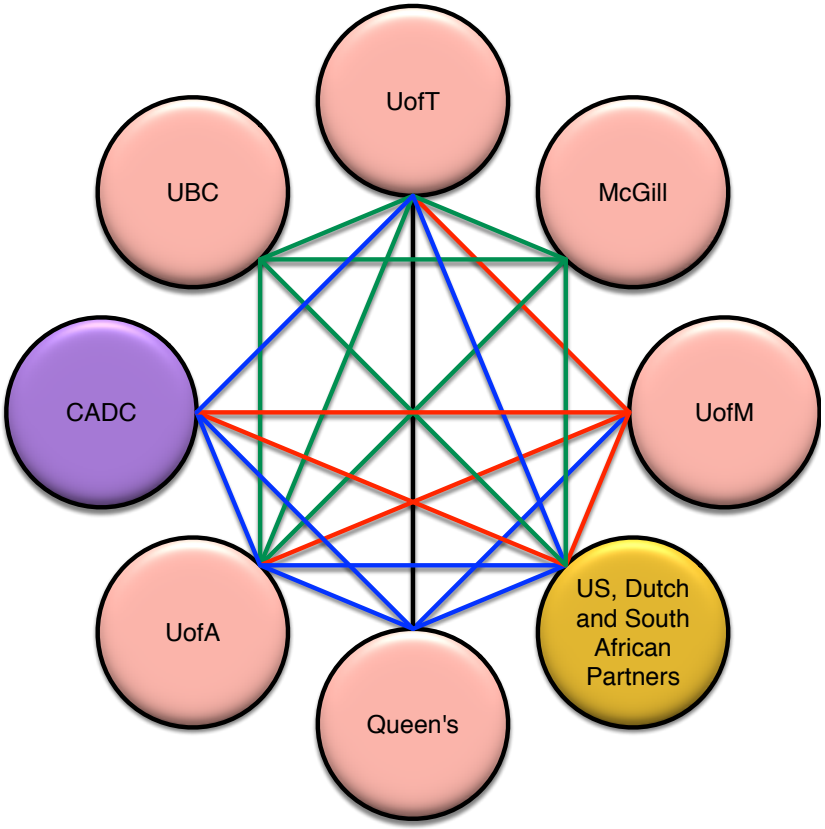
Credit: Bill Saxton, NRAO/AUI/NSF

ASKAP Wallaby

Atomic gas maps for thousands of galaxies
~10 x deeper, 10 x sharper than current all-sky surveys!

Building community





Existing Collaborations

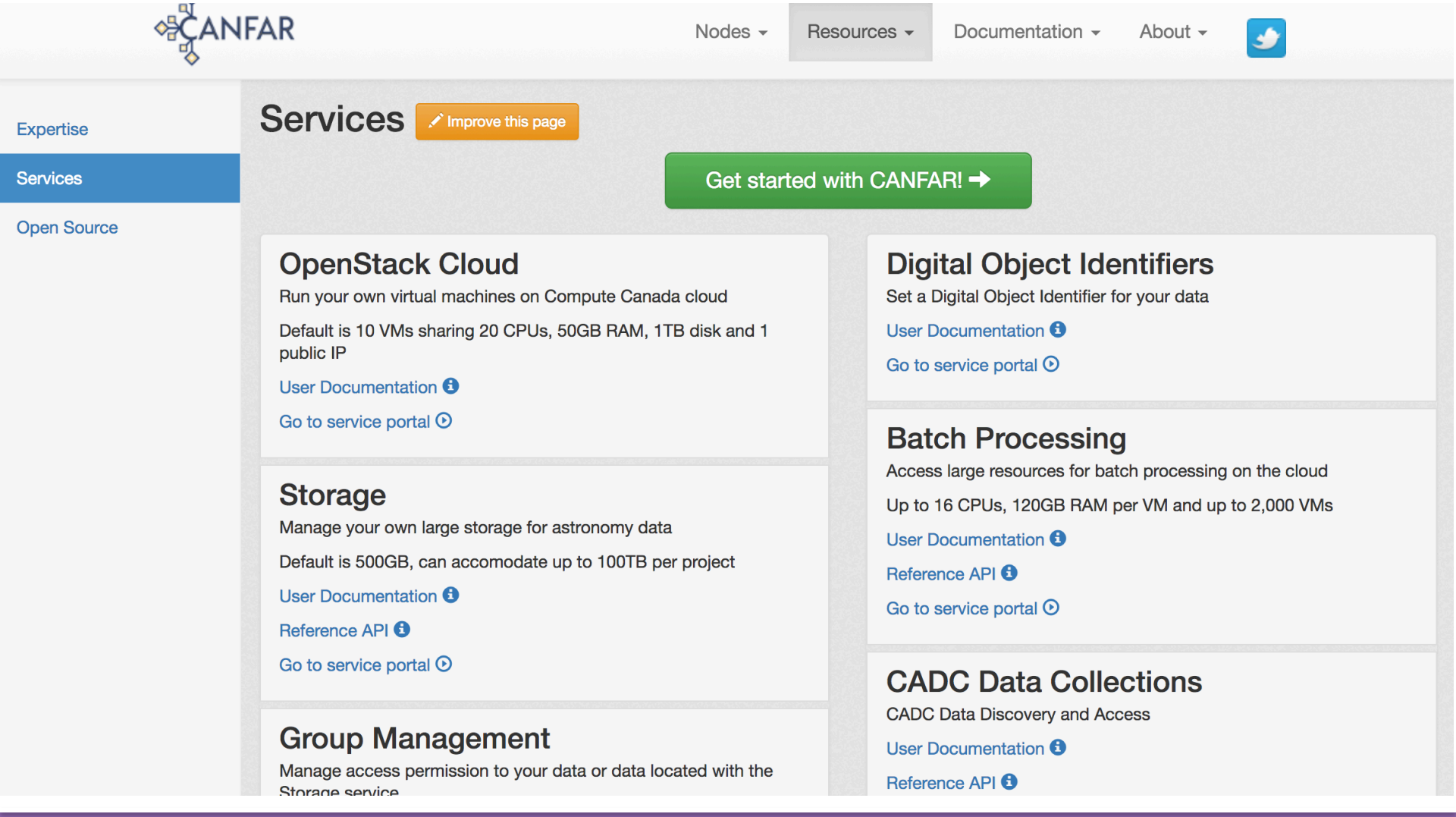
VLASS

VLASS & CHIME

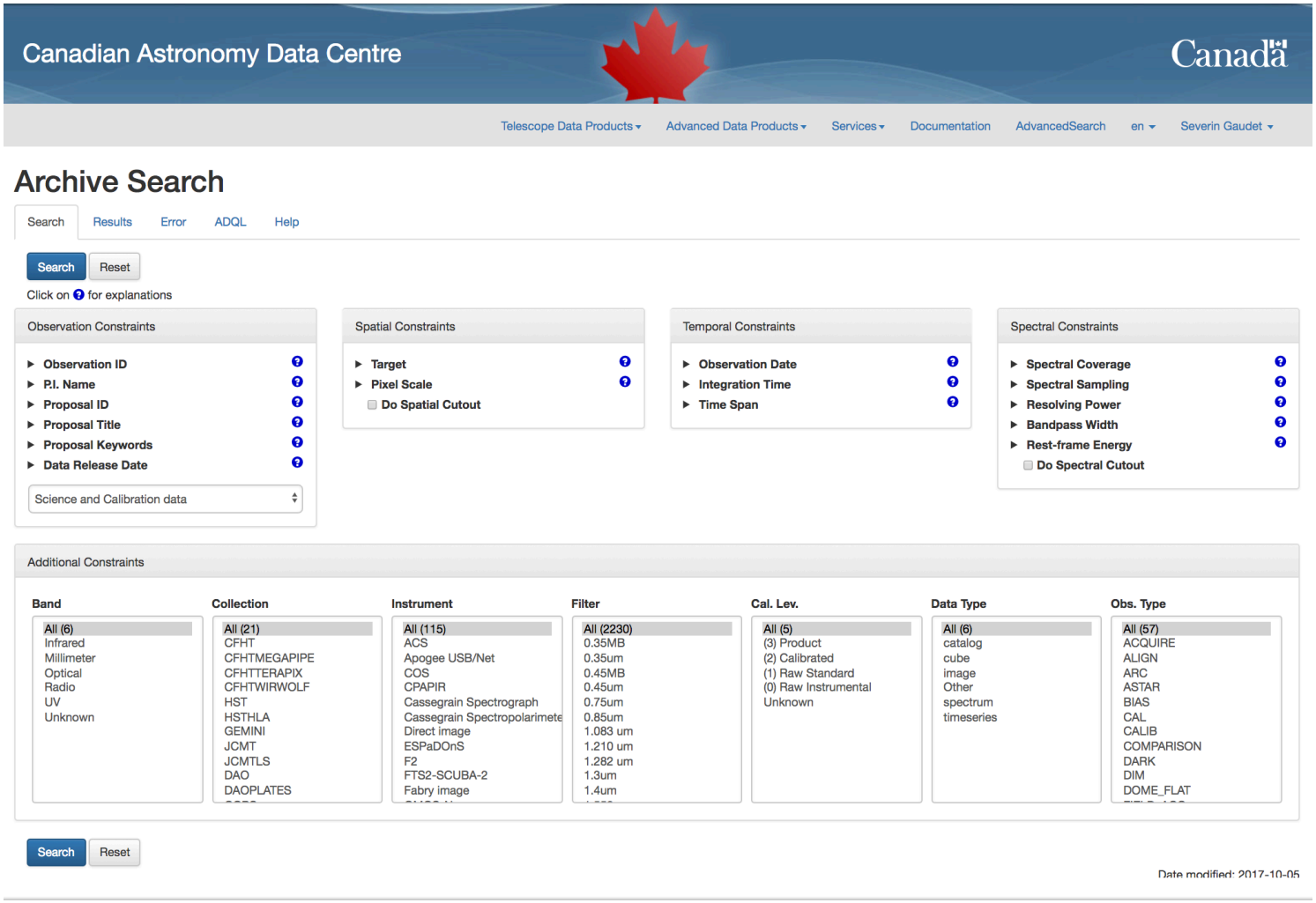
VLASS & ASKAP

VLASS, ASKAP & CHIME

Existing Infrastructure: Canadian Advanced Network for Astronomical Research



Existing Infrastructure: Canadian Astronomy Data Centre



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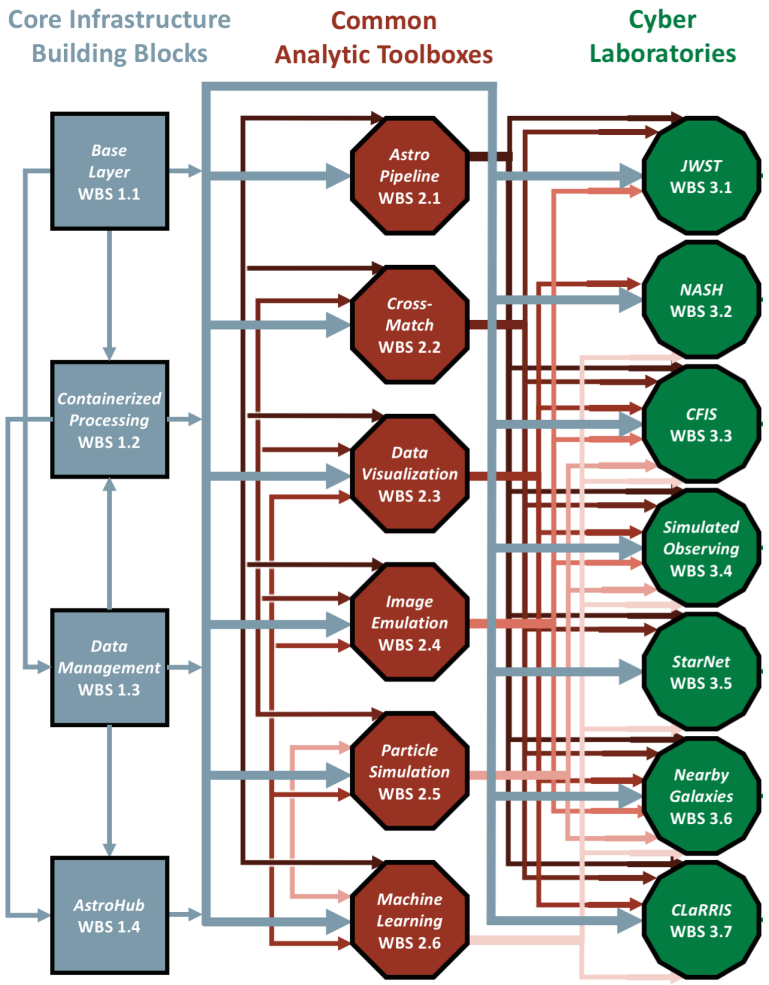
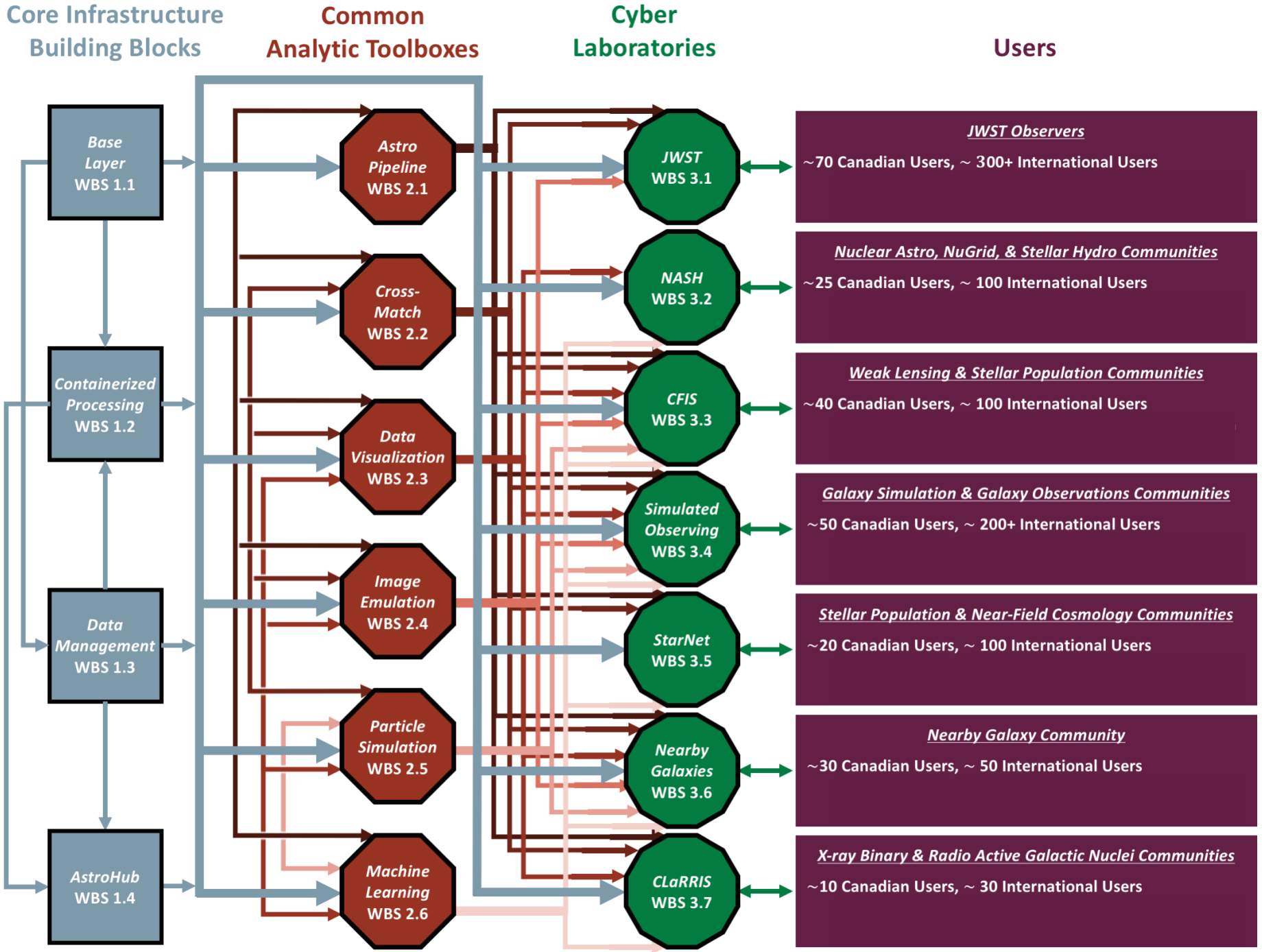
CANFAR Astronomy Cyber Laboratory Platform

- $4.5M (€3.1M) CFI Cyber-infrastructure Fund proposal (PI: Falk Herwig)
- *Will address the challenges of accommodating the data deluge, of enabling a data refinery, of data fusion and shared analytics, of providing for flexible international access and of liberating science software and reproducible science.*

CANFAR Astronomy Cyber Laboratory Platform

- 3-year project involving:
  - Canadian Advanced Network for Astronomical Research
  - Canadian Astronomy Data Centre
  - University of Victoria
  - University of British Columbia
  - University of Alberta
  - University of Toronto
  - McMaster University
  - University of Western Ontario
  - Université de Montréal
  - Saint Mary's University




Core Infrastructure Building Blocks
Common Analytic Toolboxes
Cyber Laboratories
Users
Base Layer WBS 1.1
Containerized Processing WBS 1.2
Data Management WBS 1.3
AstroHub WBS 1.4
Astro Pipeline WBS 2.1
Cross-Match WBS 2.2
Data Visualization WBS 2.3
Image Emulation WBS 2.4
Particle Simulation WBS 2.5
Machine Learning WBS 2.6
JWST WBS 3.1
NASH WBS 3.2
CFIS WBS 3.3
Simulated Observing WBS 3.4
StarNet WBS 3.5
Nearby Galaxies WBS 3.6
CLaRRIS WBS 3.7
JWST Observers
~70 Canadian Users, ~ 300+ International Users
Nuclear Astro, NuGrid, & Stellar Hydro Communities
~25 Canadian Users, ~ 100 International Users
Weak Lensing & Stellar Population Communities
~40 Canadian Users, ~ 100 International Users
Galaxy Simulation & Galaxy Observations Communities
~50 Canadian Users, ~ 200+ International Users
Stellar Population & Near-Field Cosmology Communities
~20 Canadian Users, ~ 100 International Users
Nearby Galaxy Community
~30 Canadian Users, ~ 50 International Users
X-ray Binary & Radio Active Galactic Nuclei Communities
~10 Canadian Users, ~ 30 International Users

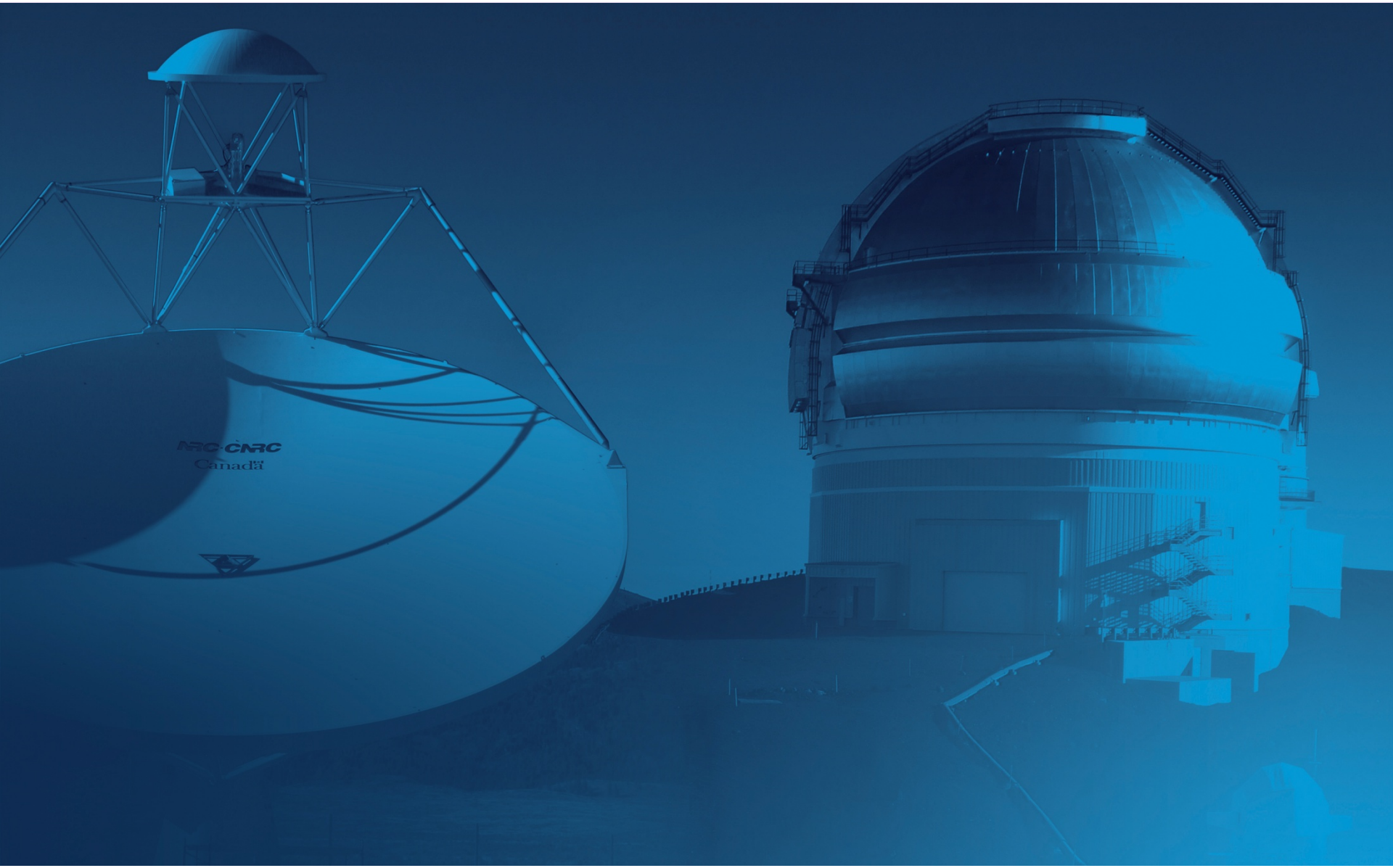
A Canadian SKA Regional Centre

- Challenges
  - Understanding how users will use a regional centre
  - Matching infrastructure to support user workflows
  - Estimating processing and storage requirements

Some numbers based on Canada's nominal SKA share of ~6%

- Storage: 36 petabytes at start; 60 petabytes/year growth
- Processing: 30 petaflops at start; 60 petaflops by 2030
- Networking: 100 gigabit for SKA data alone

- Activities
  - Continued participation in SRCCG and networking groups
  - Collaborations with other SRC initiatives
  - Building experience: VLASS, CHIME, ASKAP, CANFAR


NRC·CNRC
Canada