Canada, the MWA, and CANDIAPL

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UNIVERSITY OF ALBERTA

Canadian Radio Astronomy Facilities: The 2020 Long Range Plan Perspective

Current (2020) Facilities

ALMA

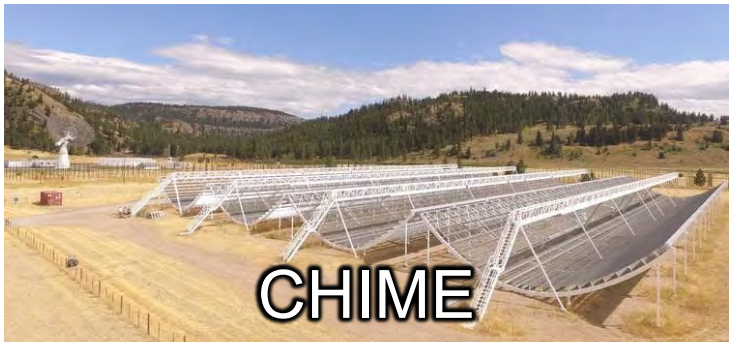
MWA

CHIME

Dominion Radio Astronomy Observatory

Canadian Radio Astronomy Facilities: The 2020 Long Range Plan Perspective

Current (2020) Facilities



Canadian Radio Astronomy Facilities: The 2020 Long Range Plan Perspective

Current (2020) Facilities

Canadian Radio Astronomy Facilities: The 2020 Long Range Plan Perspective

Future (2020) Facilities

Canadian Radio Astronomy Facilities: The 2020 Long Range Plan Perspective

Highest 2020-2030 Priority: SKA

Canadian Preparation for the SKA (Approach I)

Canadian Astronomy Data Centre (CADC) +
Canadian Advanced Network for Astronomy Research (CANFAR)

Lowest Effort, Lowest Risk of Failure, Moderate Reward

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Canadian Astronomy Data Centre (CADC) +
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Lowest Effort, Lowest Risk of Failure, Moderate Reward

Builds on CADC expertise

Enhance computing using annually allocation national resources (CANFAR) to prepare for large data needs.

Make results open source. (https://github.com/opencadc)

Canadian Advanced Network for Astronomical Research (CANFAR)

https://www.canfar.net/en/docs/overview/

CANFAR Science Portal

(Browser accessible container-based science platform)

Storage Management

(Web, command line, & python interface to data)

Group Management

Data Publication Service

(Storage space plus DOI linking of data and papers)

Canadian Preparation for the SKA (Approach I)

CADC/CANFAR: Why you might care

The group, data, and compute management that Canada has been developing is well set up for SKA-data centres

You can adopt parts of this as suits your needs

Some potential for computing on Canadian compute resources, if we can add to Canadian astronomy's national allocation

Canadian Preparation for the SKA (Approach II)

Canada Foundation for Innovation (CFI) funding towards projects related to SKA Pathfinders

Moderate Effort, Moderate Risk of Failure, Moderate Reward

Highly competitive calls come once every few years

Million-dollar scale projects possible

Canadian Preparation for the SKA (Approach II)

Canada Foundation for Innovation (CFI) funding towards projects related to SKA Pathfinders

Moderate Effort, Moderate Risk of Failure, Moderate Reward

Highly competitive calls come once every few years

Million-dollar scale projects possible

Multiple radio astronomy projects have been CFI funded, including CHIME (multiple upgrades), CIRADA, and CanDIAPL

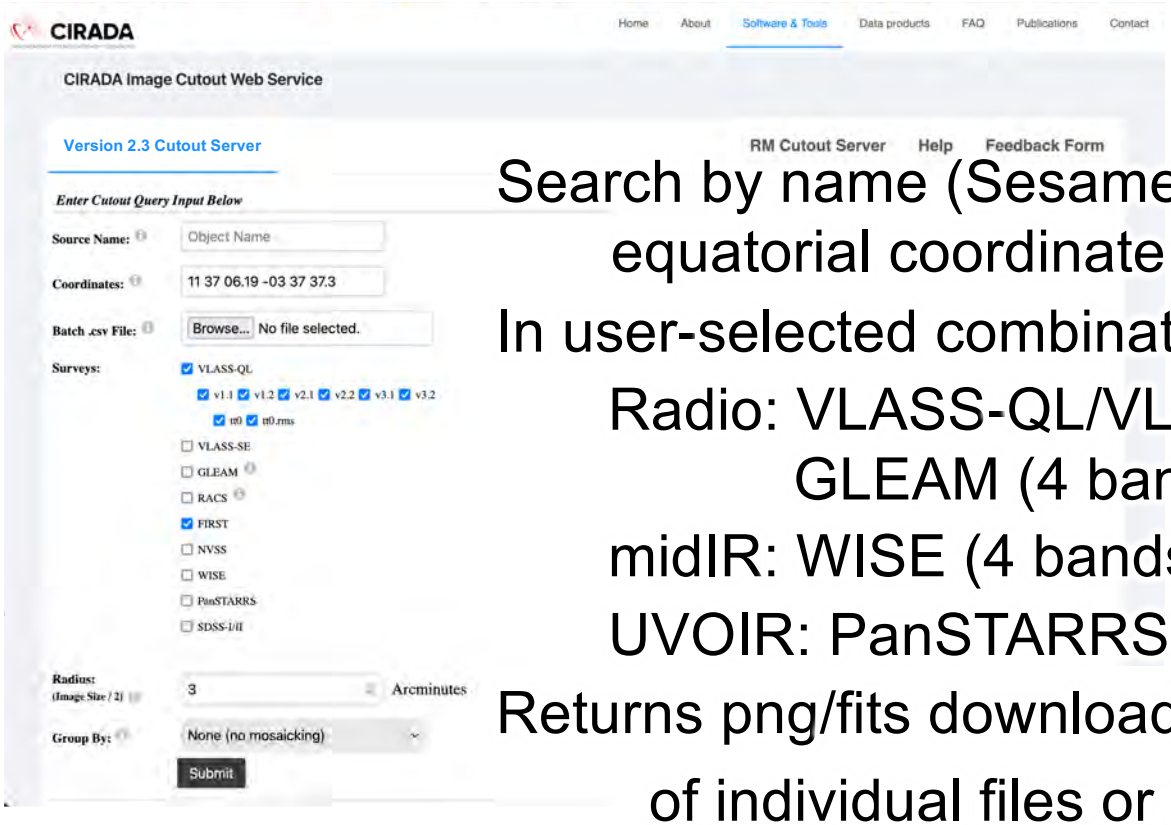
Canadian Initiative for Radio Astronomy Data Analysis
https://cirada.ca/ (2017–2023; ~8.8M CAD)

Unlocking the Radio Sky with Now-Generation Survey Astronomy

Generating **Science Ready Data Products** for

- Very Large Array Sky Survey
  VLASS
- ASKAP Widefield ASKAP L-band Legacy All-sky Blind survey
  ASKAP WALLYBY
- Facets of Canadian Hydrogen Intensity Mapping Experiment
  CHIME

http://cutouts.cirada.ca/



Search by name (Sesame-resolved) or
equatorial coordinate (many formats allowed)

In user-selected combinations of

Radio: VLASS-QL/VLASS-SE by epoch,
GLEAM (4 bands), FIRST, NVSS

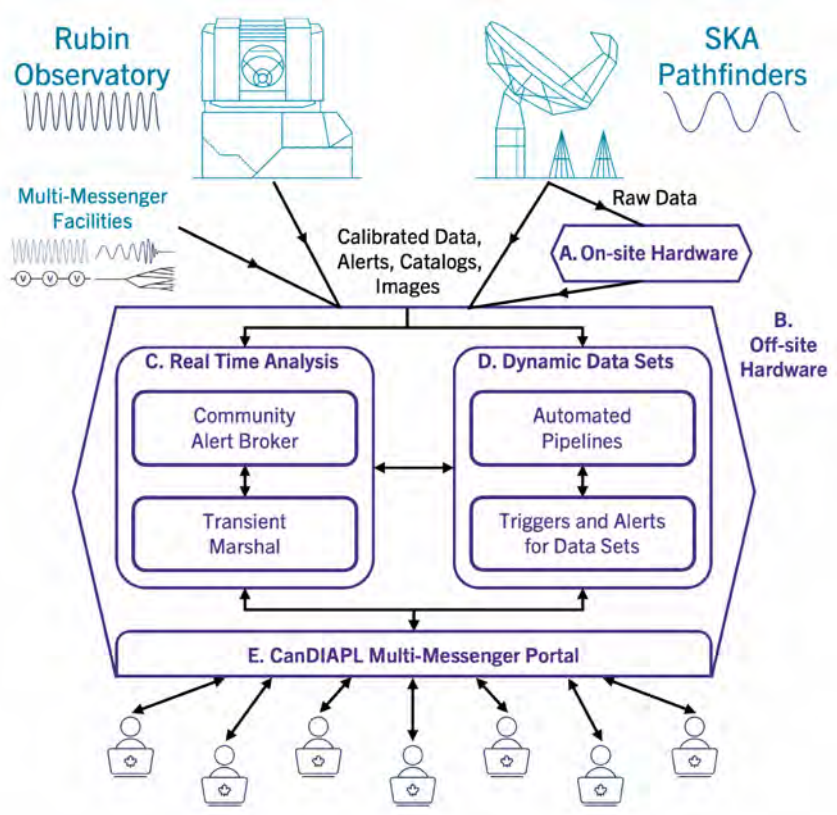
midIR: WISE (4 bands)

UVOIR: PanSTARRS (grizy), SDSS-I/II (gri)

Returns png/fits download of 2-90’ images

of individual files or mosaics can be returned
(either all from a survey, or by date-obs)

Canadian Data Intensive Platform (CanDIAPL; 2023–2029; ~14.9M CAD)



Canadian Data Intensive Platform (CanDIAPL; 2023–2029; ~14.9M CAD)

MeerKAT “Upgrade”

~1K cores, 8 TB RAM, 1.2 PB storage (goal)
in South Africa supporting Canadian-led transient science

MWA Upgrade

0.5M CAD Cash towards receiver upgrade

Off-Site Hardware

~5.4K cores, 43 TB RAM, 37 PB storage (goal)
in Canada

Canadian Data Intensive Platform (CanDIAPL; 2023–2029; ~14.9M CAD)

Software Infrastructure Developers & Operators (~78 FTE yrs)

- Community Alert Broker
  - Integrates Rubin (External), Multimessenger (External) & SKA pathfinder (CanDIAPL) alerts
- Transient Marshal
  - Integrates Rubin, Multimessenger, & SKA pathfinder data to identify sources of interest

Canadian Data Intensive Platform (CanDIAPL; 2023–2029; ~14.9M CAD)

Software Infrastructure Developers & Operators (~78 FTE yrs)

- Automated Processing Pipelines
  - Unsupervised production of science-ready data from calibrated observatory products
- Triggers and Alerts for Dynamic Data Sets
  - Triggering and alert service for dynamic data sets of the static sky that automatically notifies users when their pre-defined query conditions are met

Canadian Data Intensive Platform (CanDIAPL; 2023–2029; ~14.9M CAD)

Software Infrastructure Developers & Operators (~78 FTE yrs)

- Multimessenger Portal
  - Integrated access point and science platform for CanDIAPL data

Canadian Data Intensive Platform (CanDIAPL; 2023–2029; ~14.9M CAD)

	Hardware infrastructure					Software infrastructure		
Infrastructure / Research activity	**A. On-site hardware**		**B. Off-site hardware**	**C. Real time analysis**		**D. Dynamic data sets**		**E. Multi-messenger portal**
	MeerKAT Upgrade	MWA Upgrade	Compute & Storage	Community Alert Broker	Transient Marshal	Automated Pipelines	Alerts & Triggers	
I. Cosmic Explosions & the Transient Universe								
I.1 Galactic radio variables	✓	✓	✓	✓	✓	✓	✓	✓
I.2 Rapidly-evolving transients	✓	✓	✓	✓	✓	✓	✓	✓
I.3 Gravitational wave sources	✓	✓	✓	✓	✓	✓	✓	✓
I.4 Tidal disruptions & AGN	✓	✓	✓	✓	✓	✓	✓	✓
I.5 Supernova cosmology			✓	✓	✓	✓	✓	✓
II. Galaxies, Gas & Dark Matter								
II.1 Magnetization of the Universe			✓			✓	✓	✓
II.2 Disk galaxy structure			✓			✓	✓	✓
II.3 Star formation in galaxies			✓			✓	✓	✓
II.4 Weak lensing & dark matter			✓			✓		✓

Canadian Preparation for the SKA (Approach II)

CIRADA/CanDIAPL: Why you might care

CIRADA provides several science-ready data products for radio astronomy

Both provide or will provide open source code

CanDIAPL will provide next-gen multimessenger data products

CanDIAPL will help fund the MWA receiver upgrade

Canadian Preparation for the SKA (Approach II)

CIRADA/CanDIAPL: Why you might care

CanDIAPL is looking to maximize what we can do collaboratively.

Canadian Preparation for the SKA (Approach III)

Join SKAO

Highest Effort, Highest Risk of Failure, Highest Reward

Canadian Preparation for the SKA (Approach III)

Join SKAO (269M CAD investment)

Highest Effort, Highest Risk of Failure, Highest Reward

SKA Canada Science Fellowship program (name TBD)

- Postdoc openings!

SKA Regional Centre for Canada funded

- Job openings!
- Significant computer and storage resources!

Canada and MWA

CanDIAPL is enabling the Canadian Consortium to continue being part of the MWA family

Recent faculty shuffle has led University of Alberta to take over Canadian Consortium leadership

Capitalizing on CanDIAPL and Canadian SKAO membership, I will be working to reinvigorate MWA interest in Canada

Lots of potential to work on data-centre issues