

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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- Build community and experience with large collections

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- Enhancing existing infrastructure to support new workflows
- Major new surveys (e.g. CHIME, VLA and ASKAP)

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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

A Canadian SKA Regional Centre

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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*

➤ Algorithm development

➤ Pipeline development

➤ Infrastructure software development

➤ Education and outreach

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Unlocking the Radio Sky with Next-Generation Survey Astronomy



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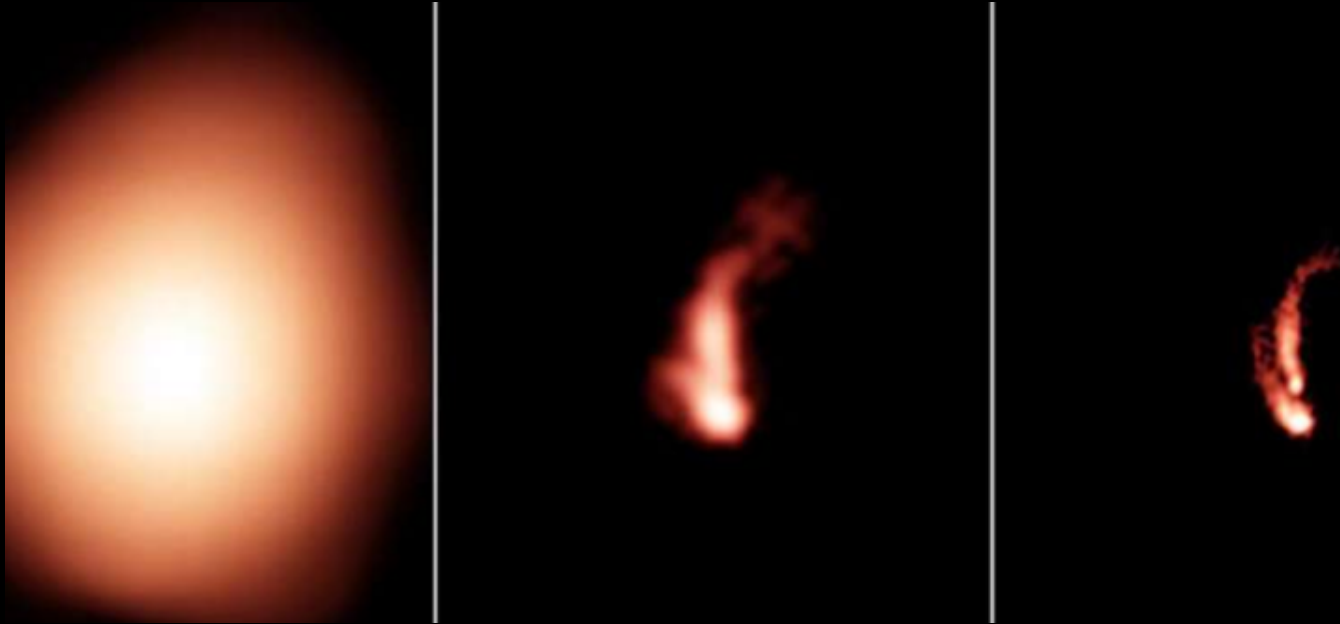
CHIME: Canadian Hydrogen Intensity Mapping Experiment (in Penticton, BC)



<https://chime-experiment.ca/>

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.

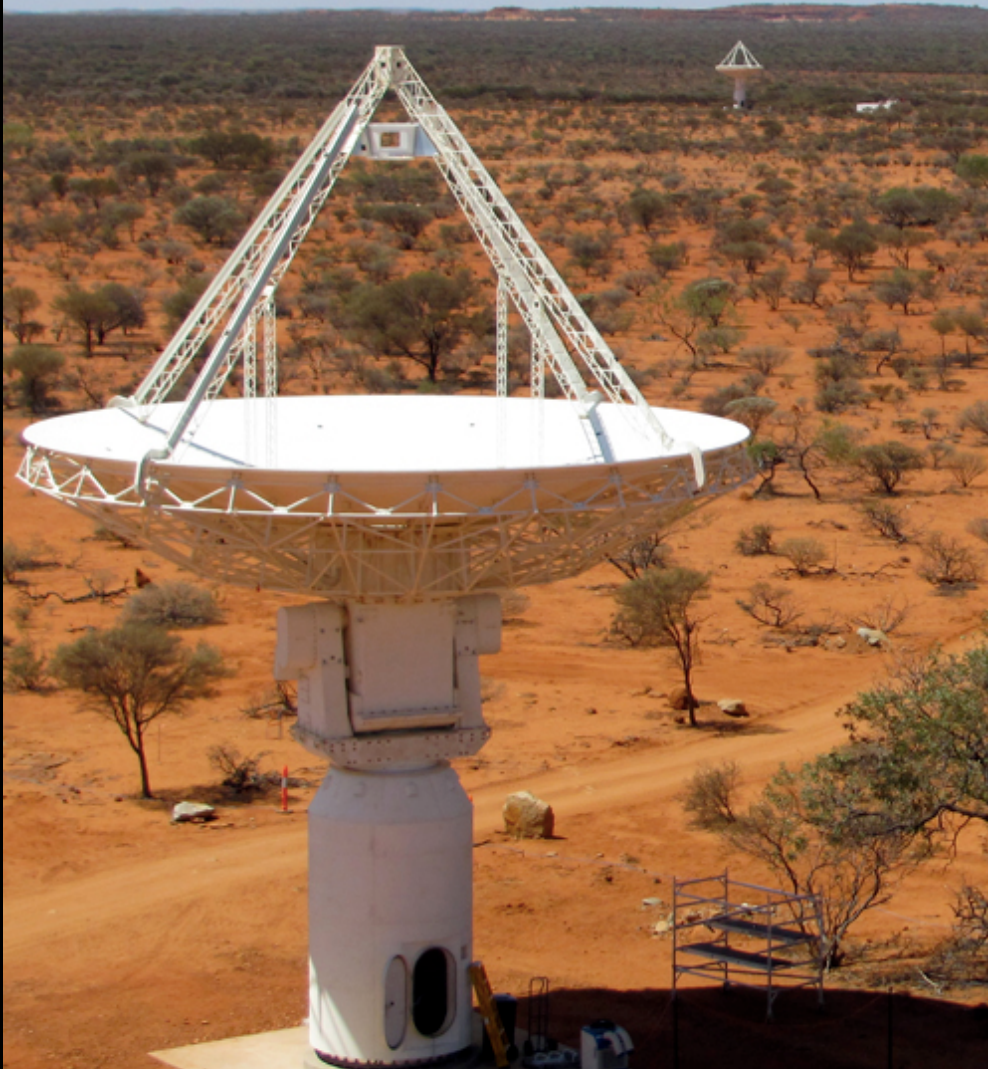
VLA Sky Survey (VLASS)



Project started Sep 2017!

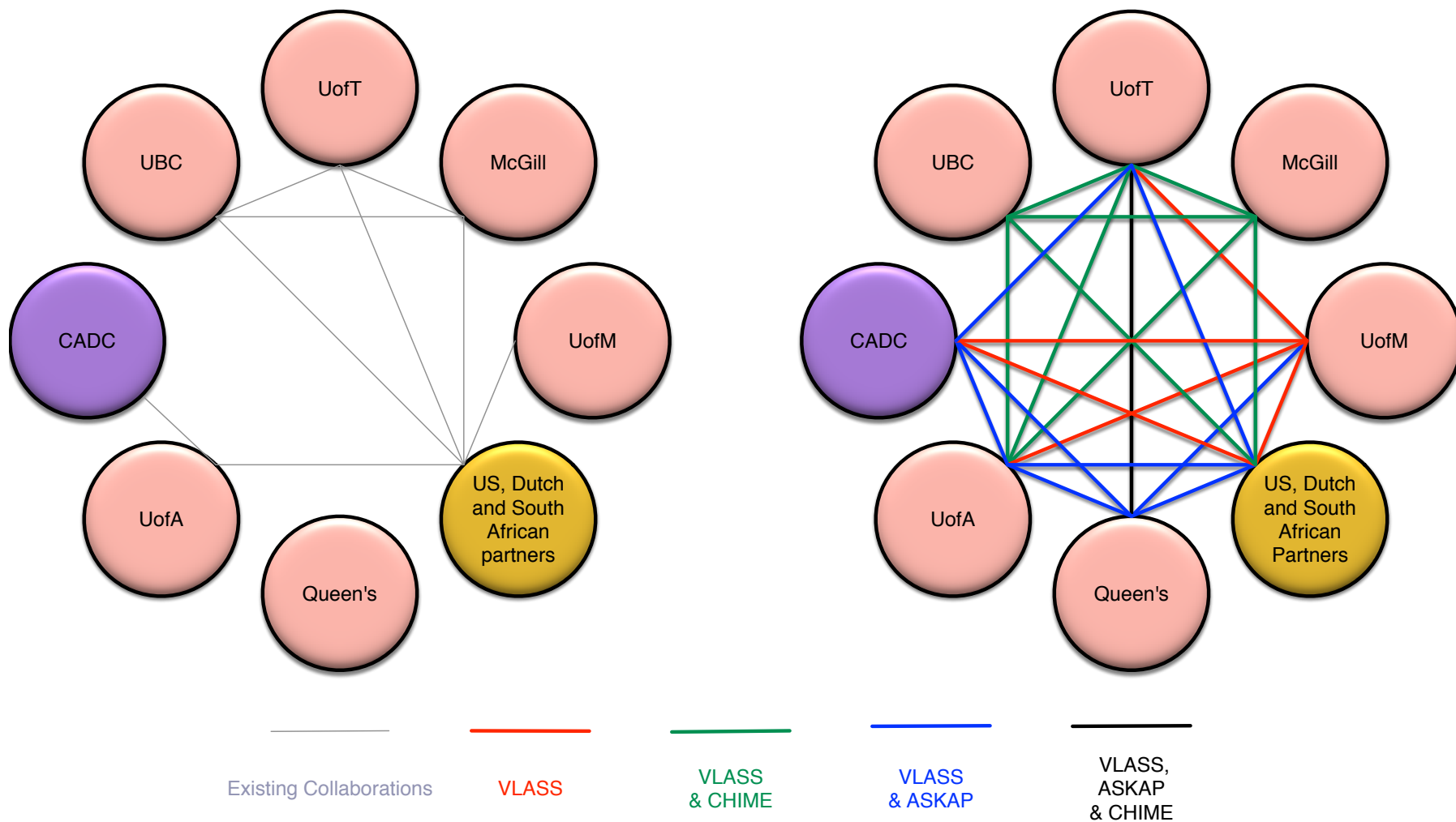
Credit: Bill Saxton, NRAO/AUI/NSF

ASKAP Wallaby



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

Building community



Existing Infrastructure: Canadian Advanced Network for Astronomical Research



Nodes ▾

Resources ▾

Documentation ▾

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Expertise

Services

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Services [✎ Improve this page](#)

Get started with CANFAR! →

OpenStack Cloud

Run your own virtual machines on Compute Canada cloud

Default is 10 VMs sharing 20 CPUs, 50GB RAM, 1TB disk and 1 public IP

[User Documentation](#) ⓘ

[Go to service portal](#) ↻

Storage

Manage your own large storage for astronomy data

Default is 500GB, can accommodate up to 100TB per project

[User Documentation](#) ⓘ

[Reference API](#) ⓘ

[Go to service portal](#) ↻

Group Management

Manage access permission to your data or data located with the Storage service

Digital Object Identifiers

Set a Digital Object Identifier for your data

[User Documentation](#) ⓘ

[Go to service portal](#) ↻

Batch Processing

Access large resources for batch processing on the cloud

Up to 16 CPUs, 120GB RAM per VM and up to 2,000 VMs

[User Documentation](#) ⓘ

[Reference API](#) ⓘ

[Go to service portal](#) ↻

CADC Data Collections


CADC Data Discovery and Access

[User Documentation](#) ⓘ

[Reference API](#) ⓘ

Existing Infrastructure: Canadian Astronomy Data Centre

Canadian Astronomy Data Centre



[Telescope Data Products](#) [Advanced Data Products](#) [Services](#) [Documentation](#) [AdvancedSearch](#) [en](#) [Severin Gaudet](#)

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Observation Constraints

▶ Observation ID

▶ P.I. Name

▶ Proposal ID

▶ Proposal Title

▶ Proposal Keywords

▶ Data Release Date

Science and Calibration data

Spatial Constraints

▶ Target

▶ Pixel Scale

☐ Do Spatial Cutout

Temporal Constraints

▶ Observation Date

▶ Integration Time

▶ Time Span

Spectral Constraints

▶ Spectral Coverage

▶ Spectral Sampling

▶ Resolving Power

▶ Bandpass Width

▶ Rest-frame Energy

☐ Do Spectral Cutout

Additional Constraints

Band	Collection	Instrument	Filter	Cal. Lev.	Data Type	Obs. Type
All (6)	All (21)	All (115)	All (2230)	All (5)	All (6)	All (57)
Infrared	CFHT	ACS	0.35MB	(3) Product	catalog	ACQUIRE
Millimeter	CFHTMEGAPIPE	Apogee USB/Net	0.35um	(2) Calibrated	cube	ALIGN
Optical	CFHTTERAPIX	COS	0.45MB	(1) Raw Standard	image	ARC
Radio	CFHTWIRWOLF	CPAPIR	0.45um	(0) Raw Instrumental	Other	ASTAR
UV	HST	Cassegrain Spectrograph	0.75um	Unknown	spectrum	BIAS
Unknown	HSTHLA	Cassegrain Spectropolarimeter	0.85um		timeseries	CAL
	GEMINI	Direct image	1.083 um			CALIB
	JCMT	ESPaDOnS	1.210 um			COMPARISON
	JCMTLS	F2	1.282 um			DARK
	DAO	FTS2-SCUBA-2	1.3um			DIM
	DAOPLATES	Fabry image	1.4um			DOME_FLAT

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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.*

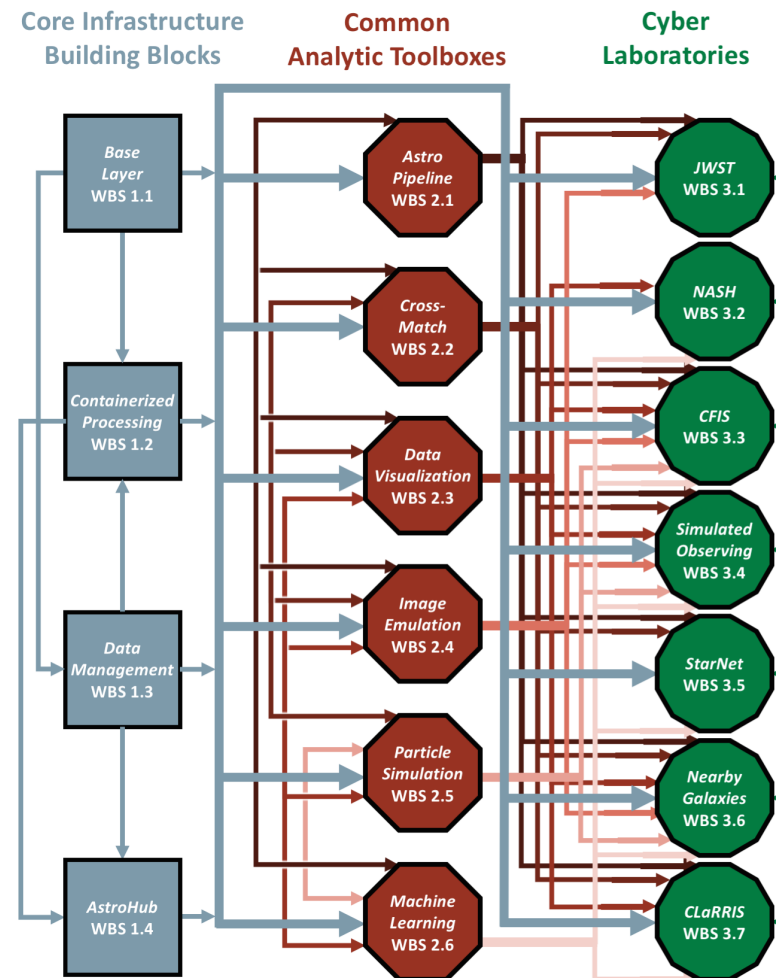
- Infrastructure software development
- Education and outreach

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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

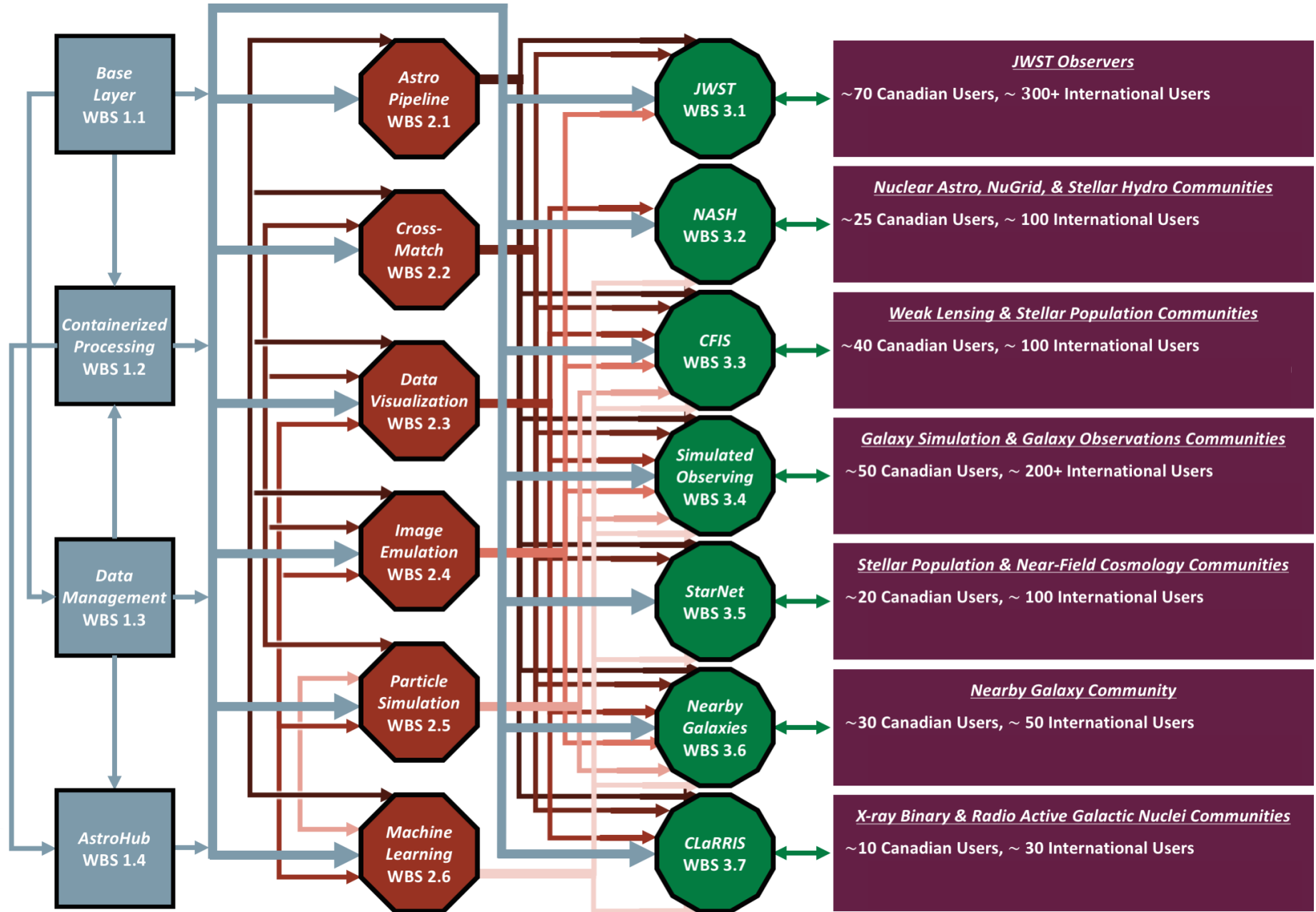


Core Infrastructure Building Blocks

Common Analytic Toolboxes

Cyber Laboratories

Users



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

