



International
Centre for
Radio
Astronomy
Research



SKA Regional Centre Activities in Australasia

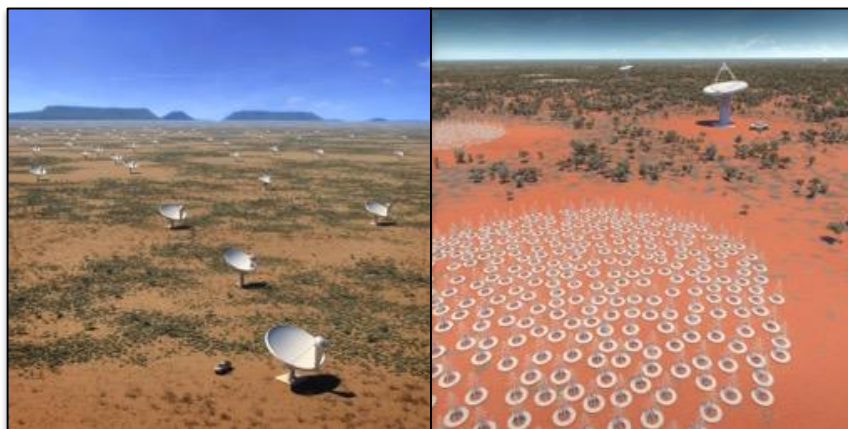
Dr Slava Kitaeff

CSIRO-ICRAR

APSRC Project Engineer
ERIDANUS National Project Lead



Why SKA Regional Centres?



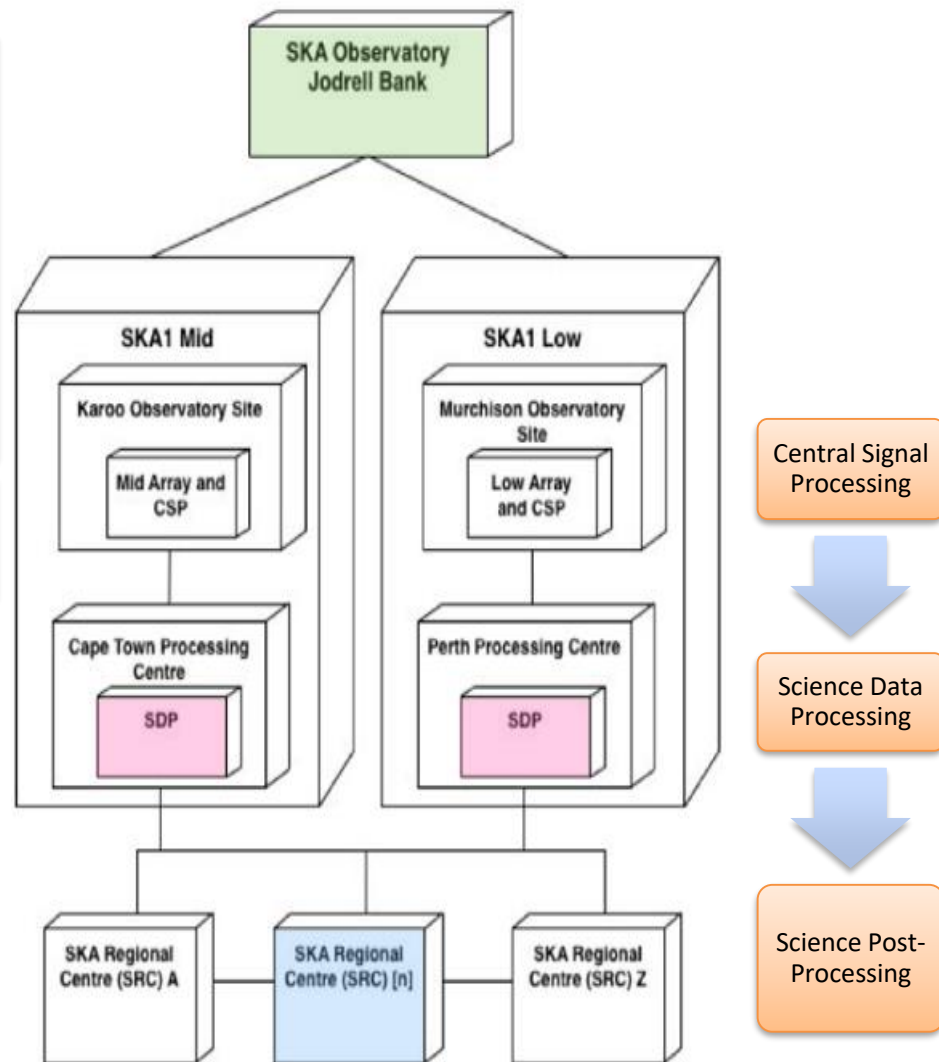
SKA 1 Observatory

Compute capacity: 100 Pflops



SKA 1 Regional Centre Alliance

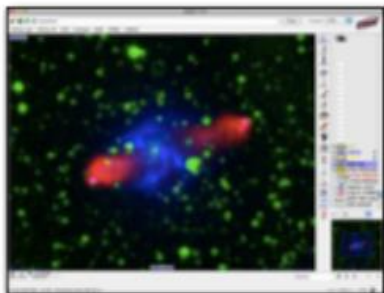
- Input: 225 PB/year science products
- Compute capacity: 100 PFlops
- Long term Science Archive: >1.1 Exabyte in 5 years



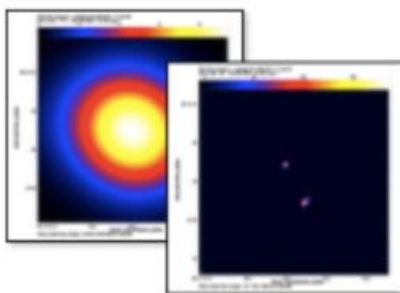
SRC Data Analysis Functionality

Data Discovery

- Observation database
- Quick-look data products
- Flexible catalog queries
- Integration with VO tools
- Publish data to VO



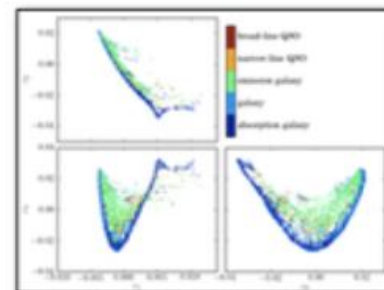
Data Processing



- Reprocessing
- Calibration and imaging
- Source extraction
- Catalog (re-)creation
- DM searches

Data Mining

- Multi-wavelength studies
- Catalog cross-matching
- Transient classification
- Feature detection
- Visualization



SKA = SKAO + SRC



SKA Observatory (SKAO)

Join SKAO-SRC functions

- User support for SKAO data products
- User support for SKAO provided software and tools
- Distribution of SKA data packs to users

SKA Regional Centers (SRC)

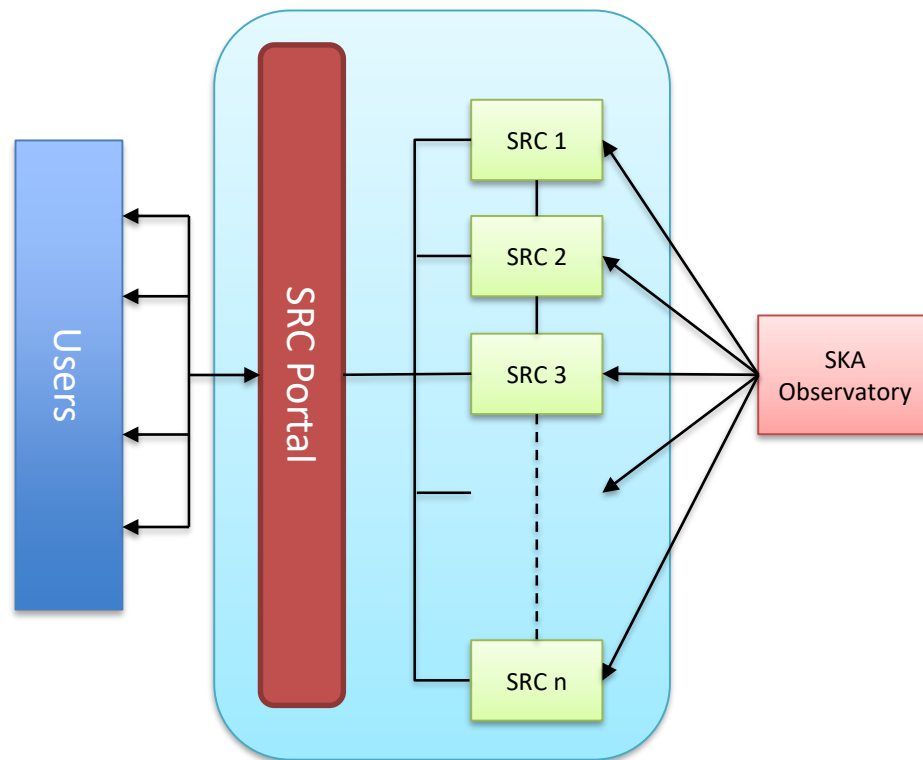
Essential SRC functions

- Development and provision of long-term SKA Science Archive
- Provision and management of computational resources for post-processing and analysis
- Provide platforms for continued development of software (pipelines and tools)

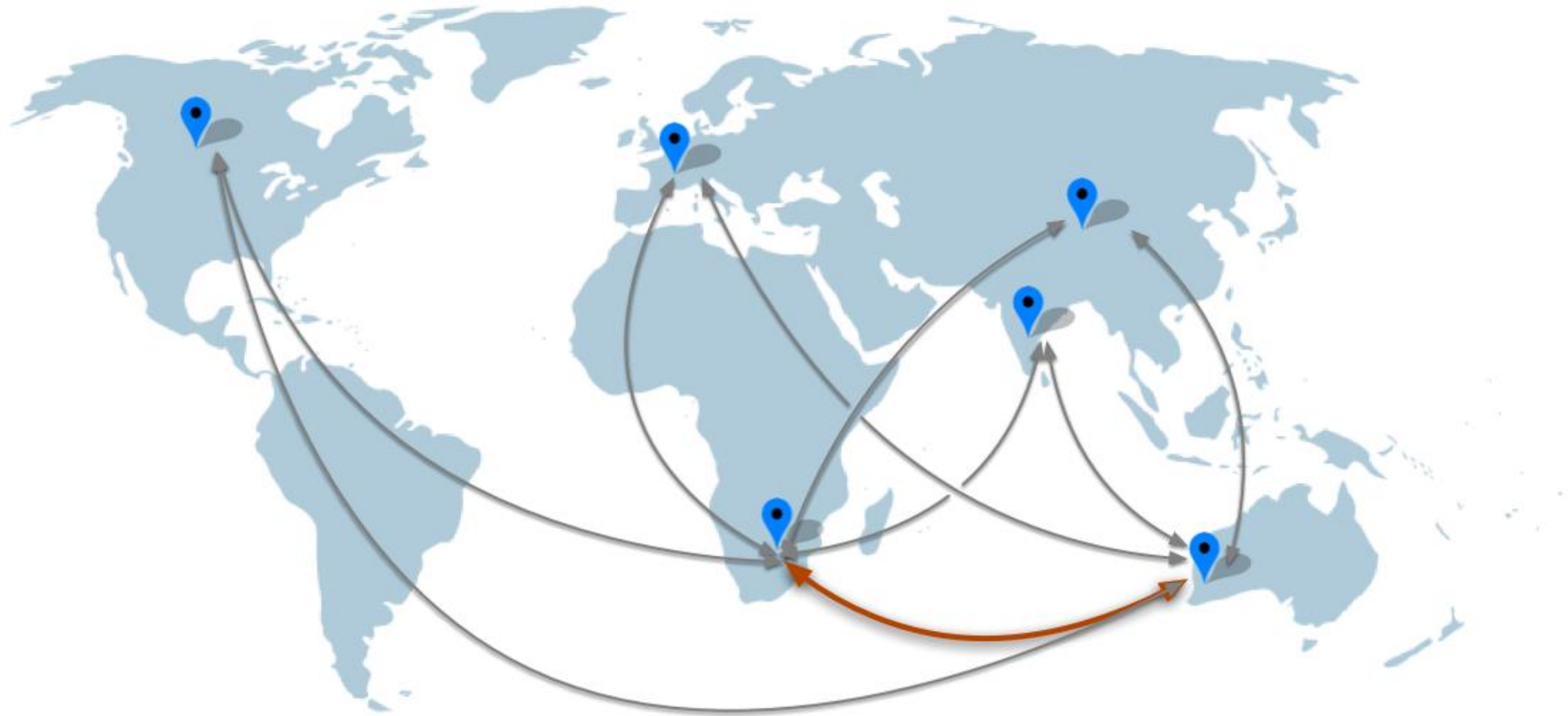
SRC for users

SRC will

- Provide access and distribute science ready data products to users
- Provide access to compute and storage resources
- Provide data analysis capabilities
- Provide user support



Global Network of SRCs



Multiple regional SRCs, locally resourced, heterogeneous in architecture.

Australian SRC WG

Key objectives:

1. To define the Australian SRC scope, opportunities, requirements and potential funding opportunities;
2. To explore opportunities to expand the Australian SRC activities to include collaboration with similar activities in China, New Zealand and the broader Asia-Pacific Region with a particular focus on business case development and precursor enabled technological and scientific programs;
3. To initiate a detailed study of the data and processing requirements and costs within an Australian SRC in support of Australian Survey Science with the SKA precursors and SKA-1.

Developing roadmaps to SRC

EU



Advanced European Network of E-infrastructures
for Astronomy with the SKA

Funded: 15.07.16

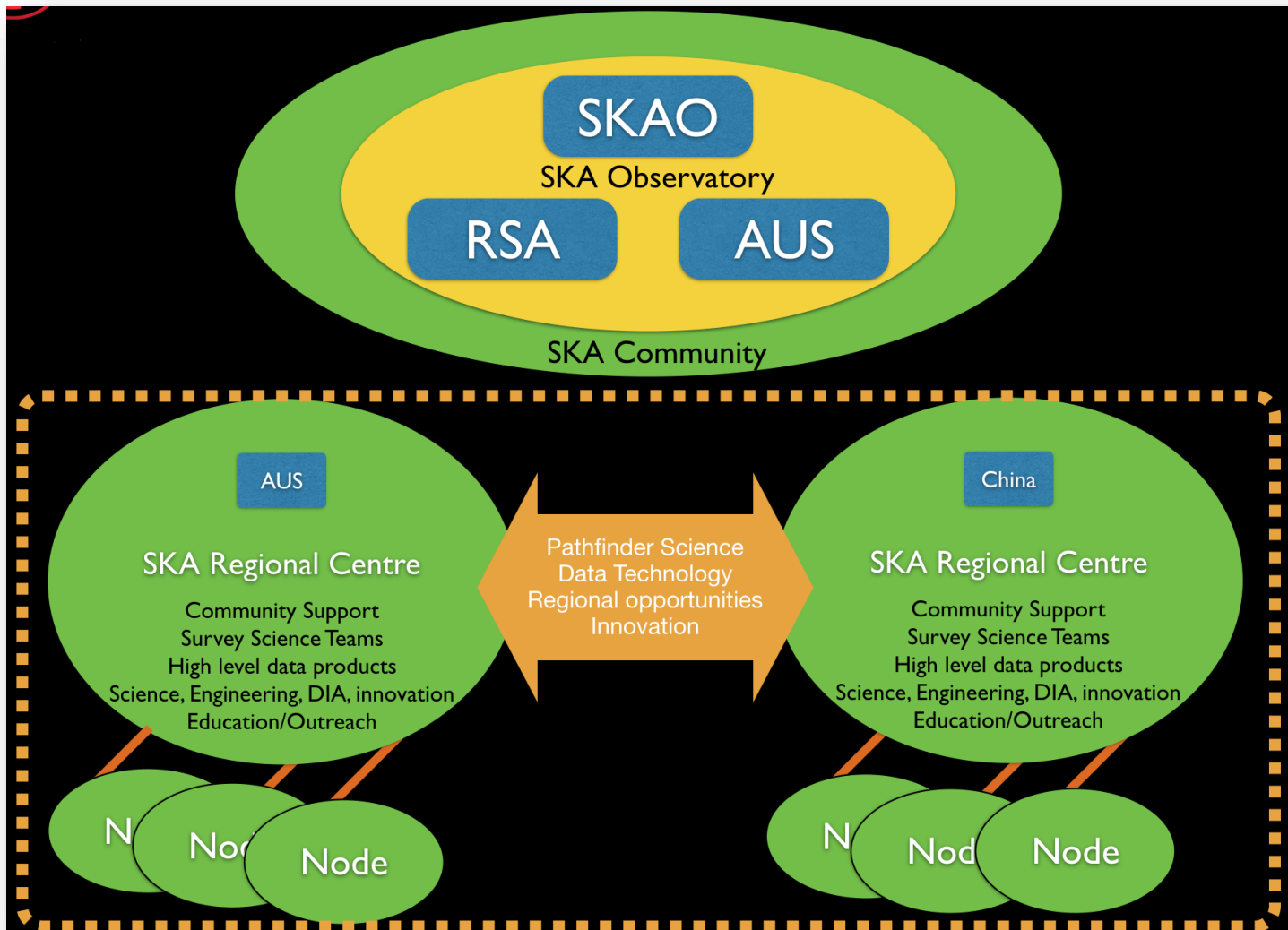
Australia

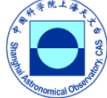


Exascale Research Infrastructure for Data in
Asian-Pacific astroNomy Using the SKA

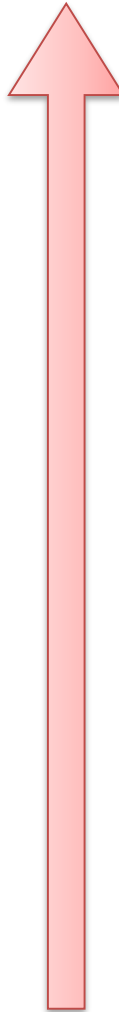
Launched 10.04.17
<http://eridanus.net.au>

Asian-Pacific SKA Regional Centre Network





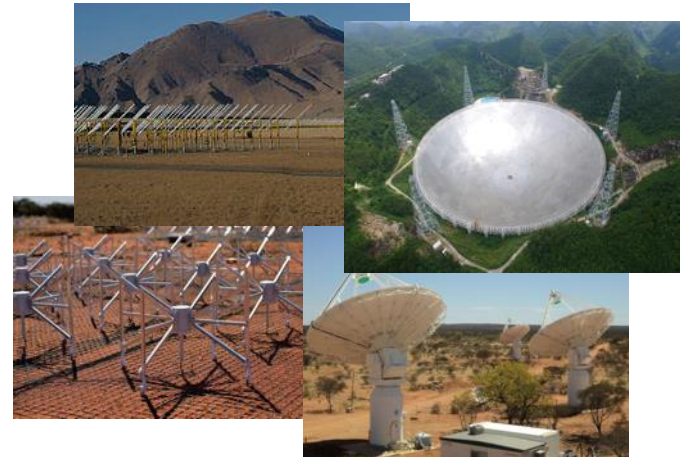
The ERIDANUS Project is a three year, **bottom-up**, design study aimed at deploying a prototype of data intensive research infrastructure and middleware between & within Australia and China, capable of addressing SKA-class data and processing challenges using SKA precursor science projects and telescopes.



SKA-1 Scale



Technology Development Projects

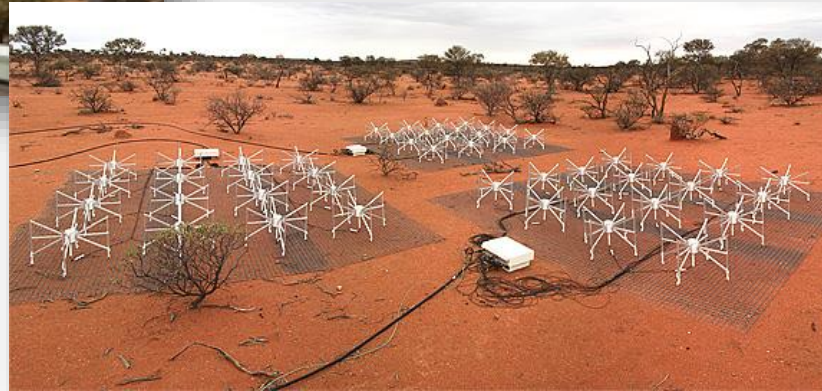


Precursor Science Projects

SKA Precursors in Australasia



ASKAP



MWA

FAST



Australian SKA Pathfinder (ASKAP)

A pilot multi-epoch continuum survey with ASKAP-BETA 13

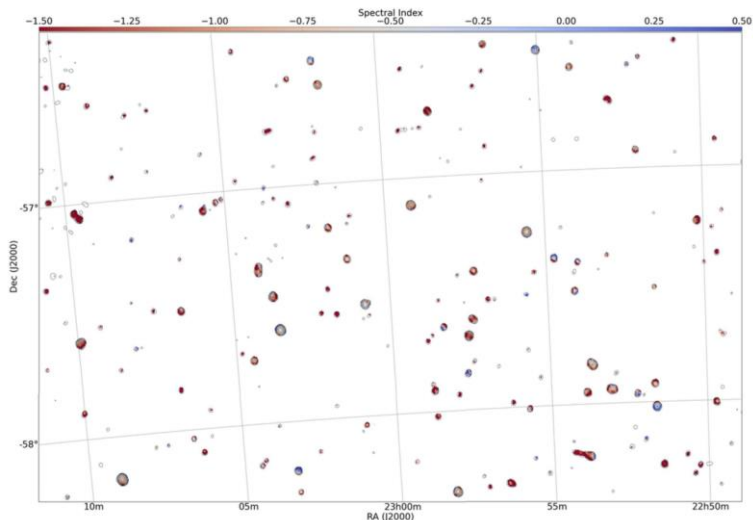
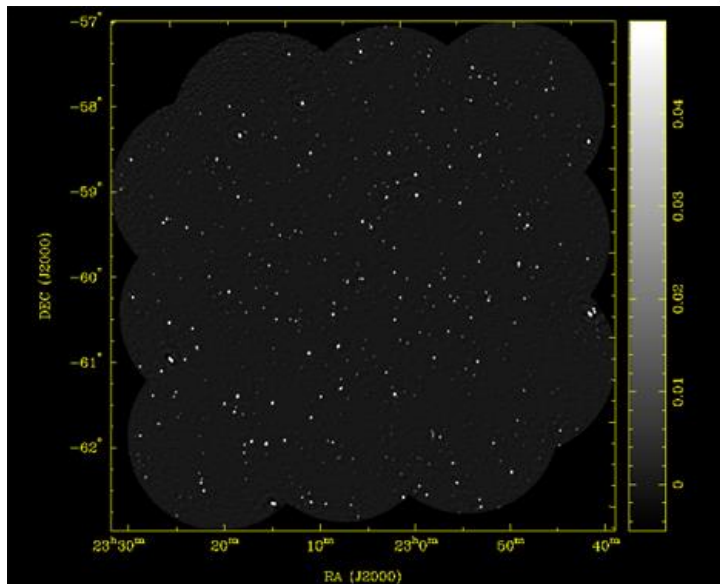
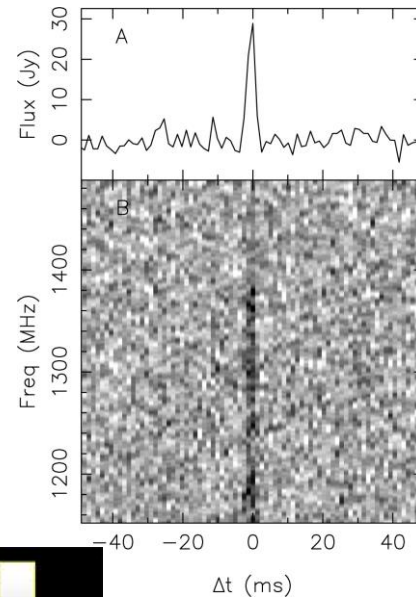


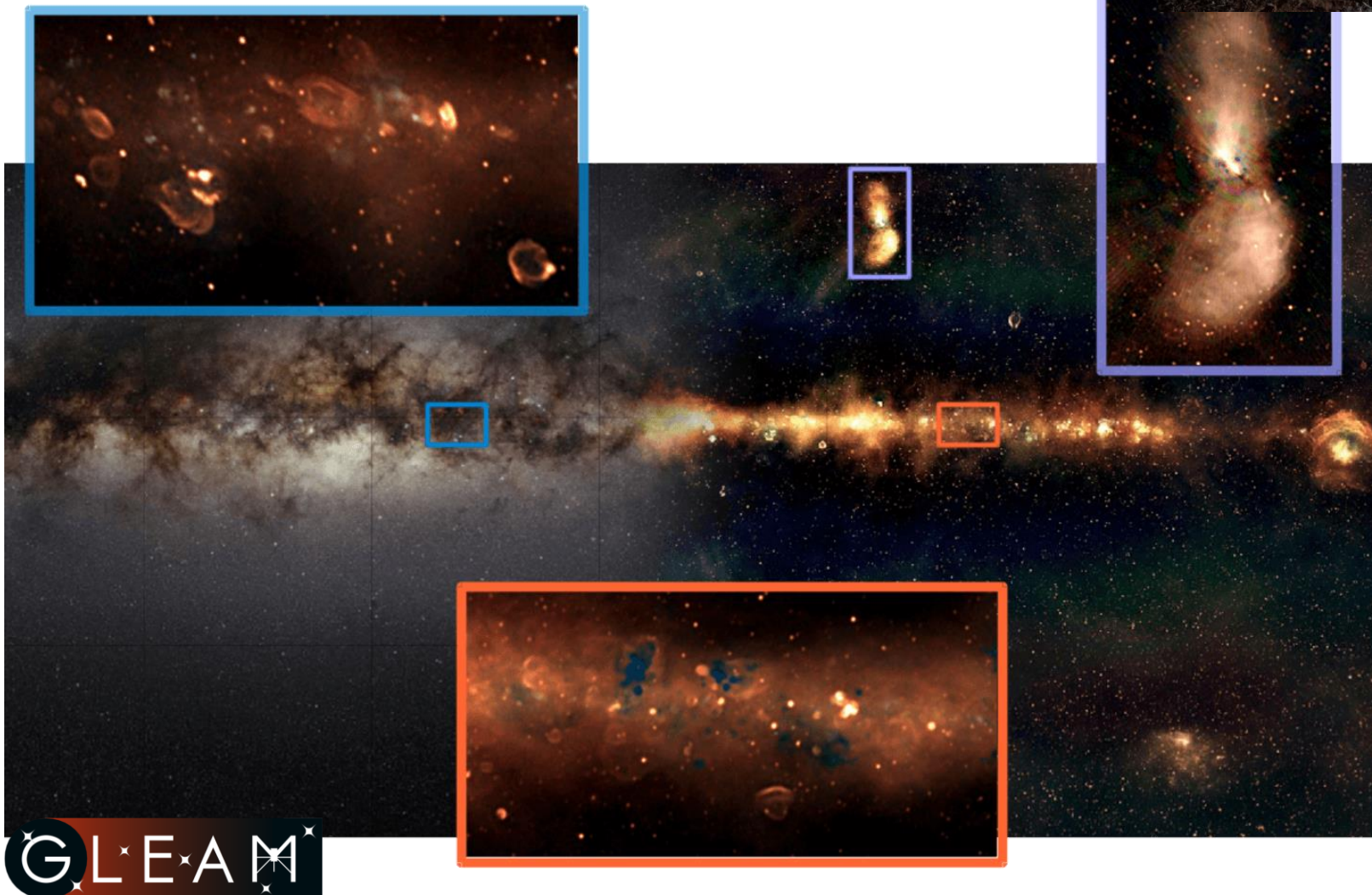
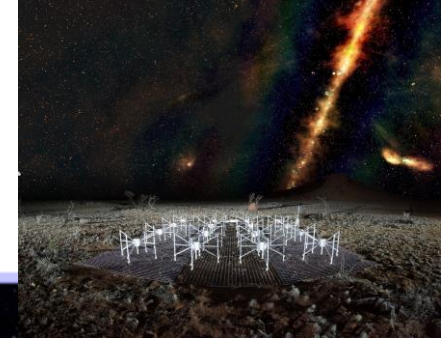
Figure 9. A $3^\circ \times 2^\circ$ region of the combined ASKAP-BETA radio continuum mosaic, as indicated in Figure 3, with total intensity contours overlaid on the spectral index image. The base contour is 5 mJy beam^{-1} and the levels increase in multiples of this according to the sequence $(5^0, 5^{0.5}, 5^{1.0}, 5^{1.5}, \dots)$.

Credit: Heywood et al.

The signal of FRB 170107, found using CSIRO's ASKAP radio telescope in less than four days of looking. Credit: K. Bannister et al.



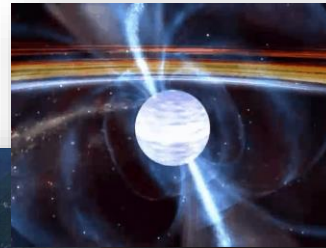
Murchison Widefield Array (MWA)



Murchison Radio-astronomy Observatory



Five-hundred-meter Aperture Spherical Radio Telescope (FAST, China)



Australia–China science and technology collaboration in astronomy

SCIENCE :

- ACAMAR (Australian-China Consortium for Astrophysical Research) alliance - optical/IR , radio, theoretical and Antarctic astronomy
- FAST, ASKAP, MWA surveys, VLBI, Kunlun

TECHNOLOGY:

- CSIRO Multi-beam technologies for FAST
- MWA partnership
- Antennae design for ASKAP (54th Research Institute of China Electronics Technology Group Corporation)

DATA:

- Joint effort on SKA SDP systems
- SDP prototypes - FAST, MWA and ASKAP
- NGAS data flow systems for FAST
- HI extragalactic spectral line pipeline for FAST
- Developing regional VO capabilities
- Capabilities and opportunities to develop regional solutions for SKA-class data flows and processing

Australia-China SKA Big Data Workshop

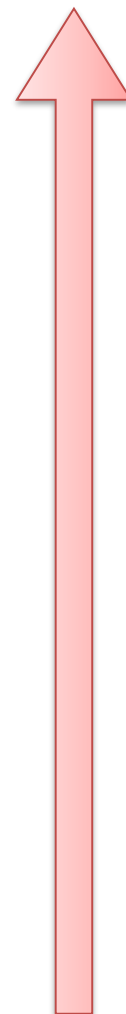


ERIDANUS

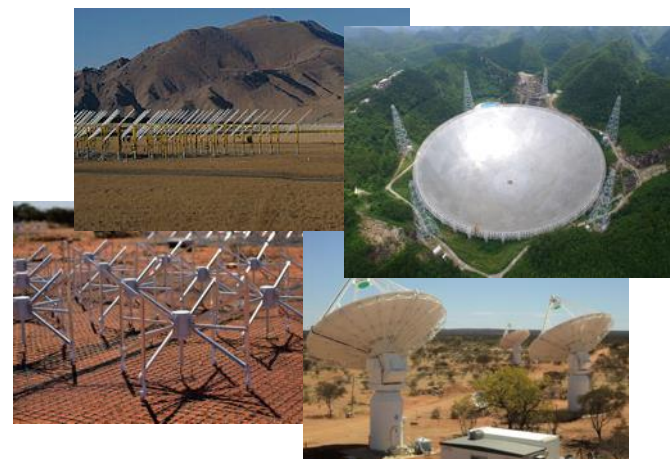
SKA-1 Scale

Focus:

- Data flow architectures
- Execution frameworks
- Strategies and systems to monitor and control cost
- Networking optimisation
- Computing options

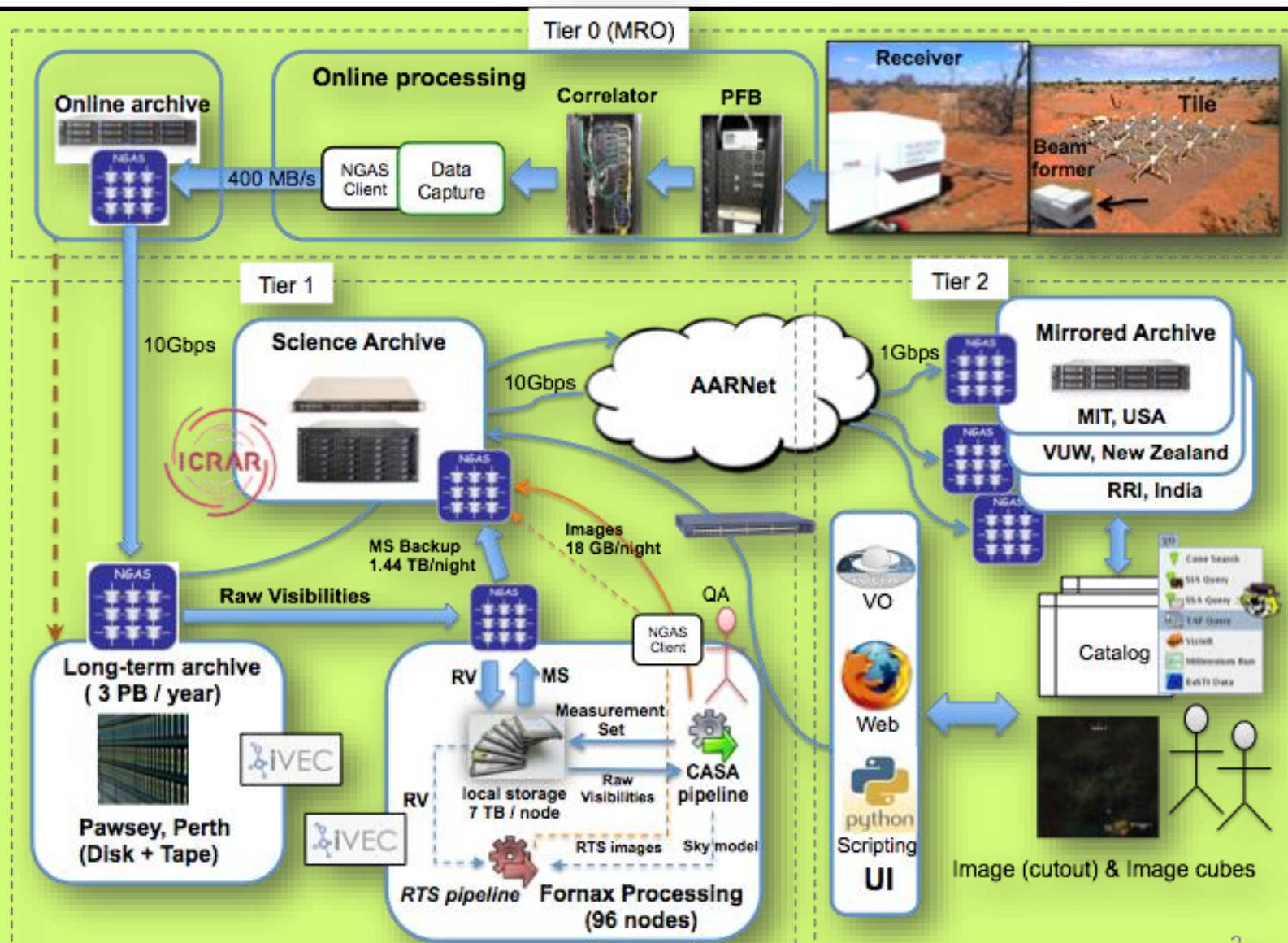


Technology Development Projects

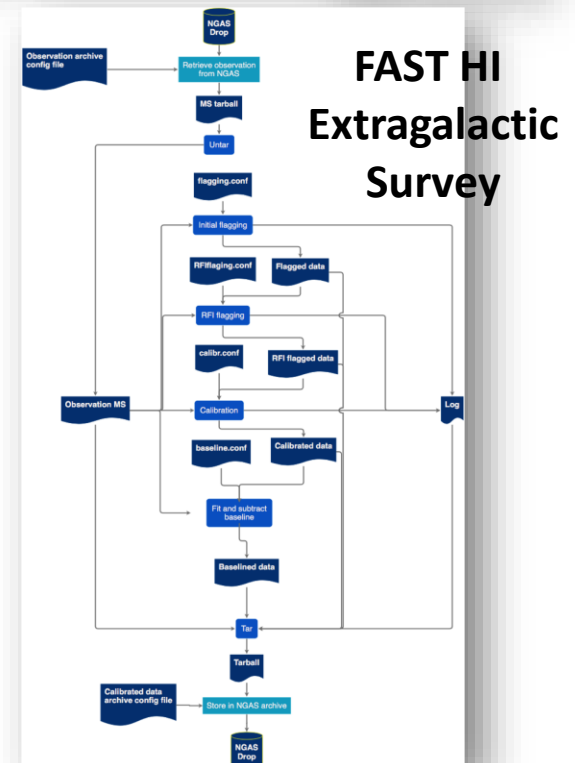
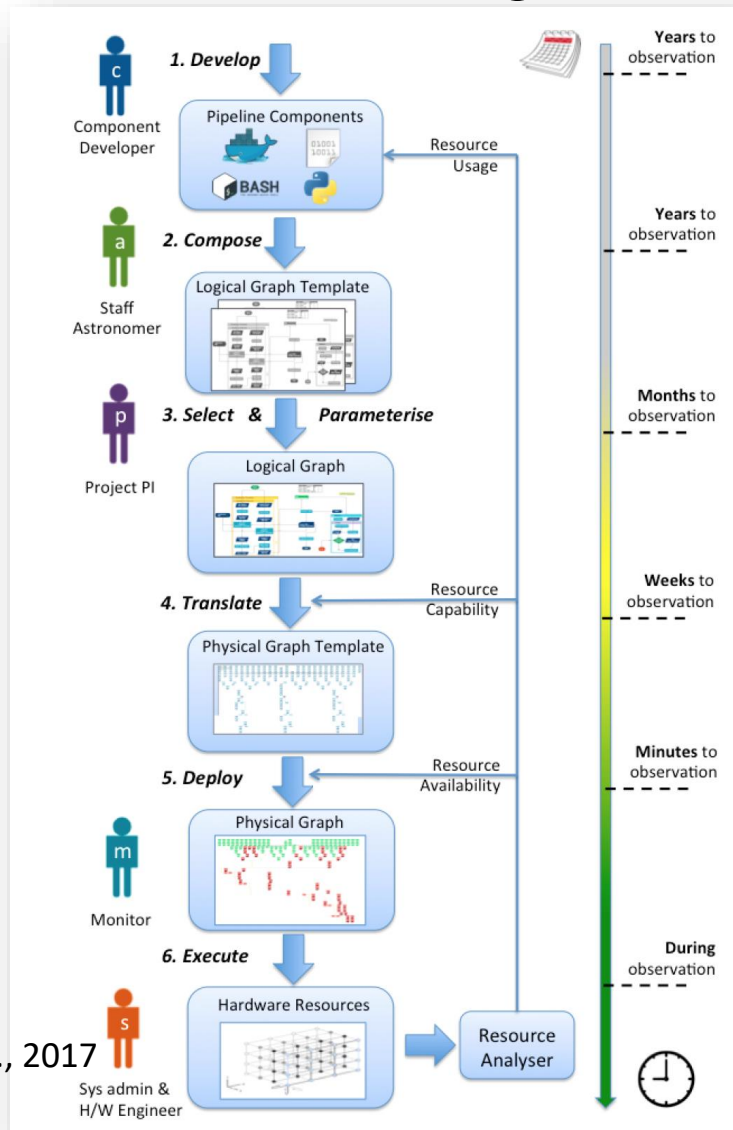


Precursor Science Projects

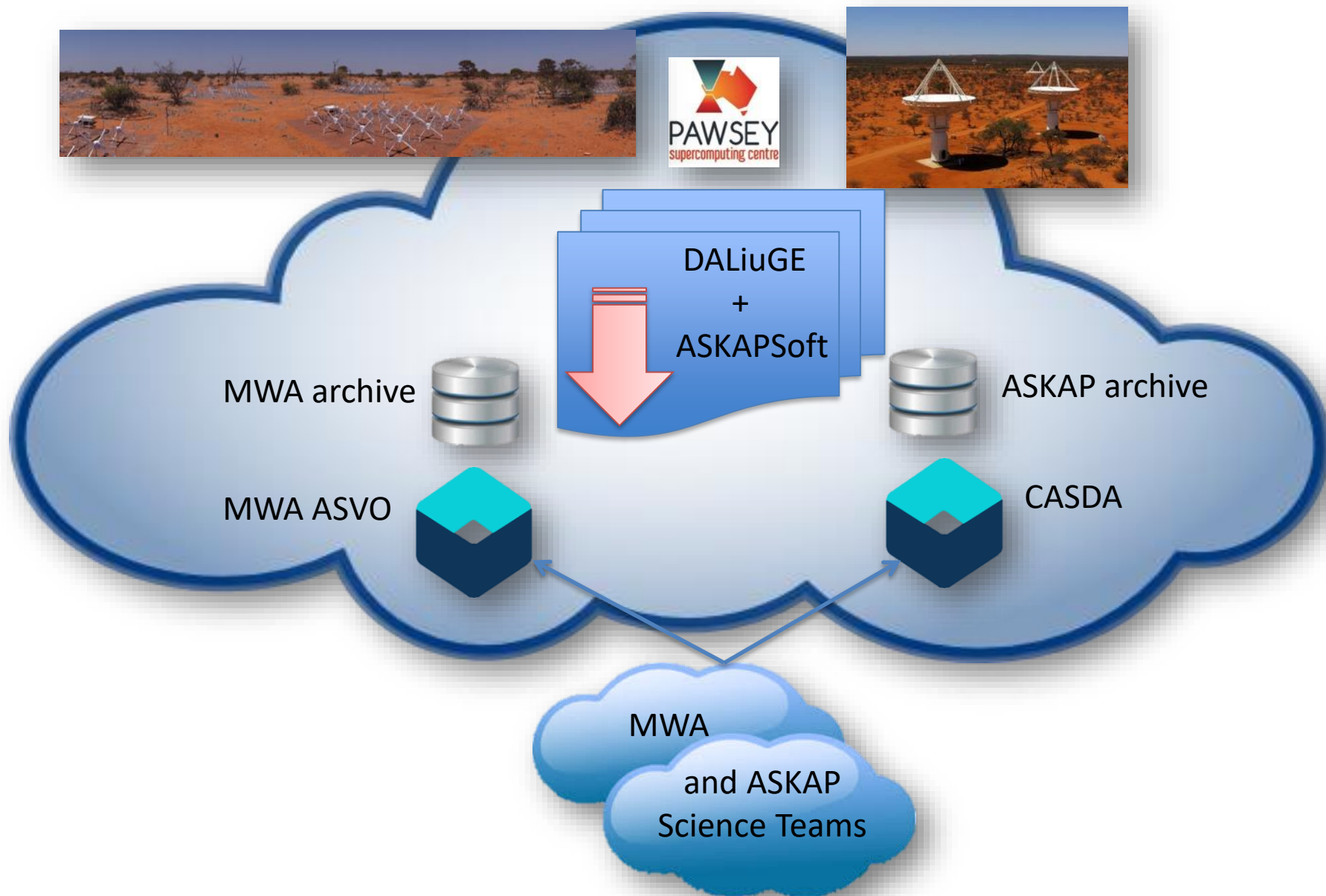
SKA1-Low prototyping - MWA data flow



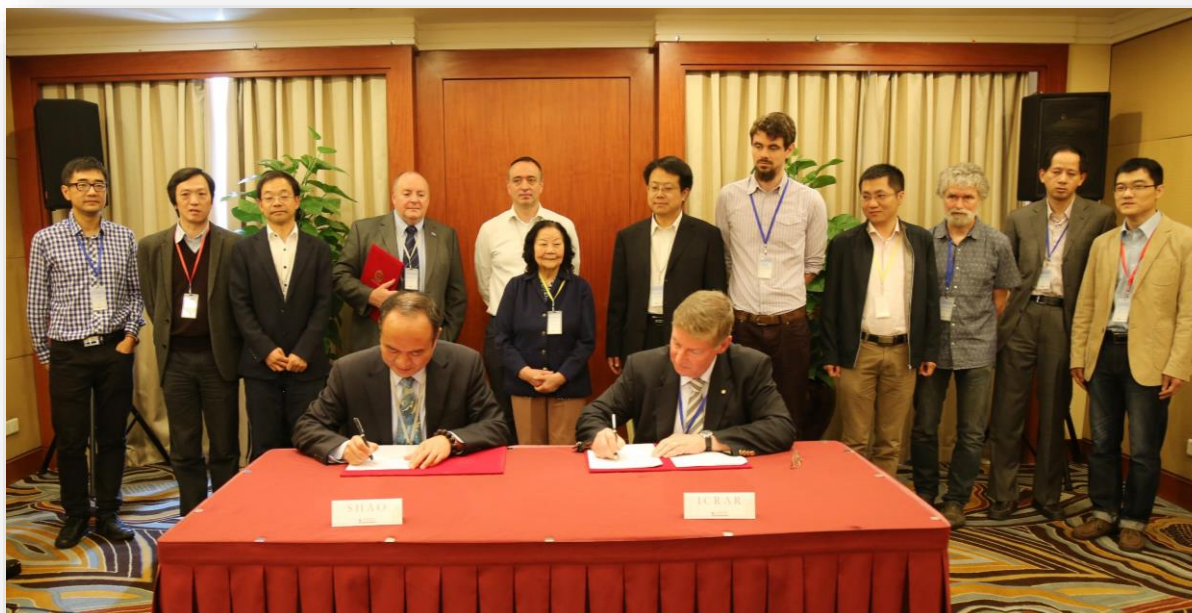
DA_{Liu}GE – Data-Activated Liu (流) Graph Engine for Harnessing the Astronomical Data **Deluge**



JACaI SKA SDP = ASKAPSoft + MWA pipeline + DALiuGE



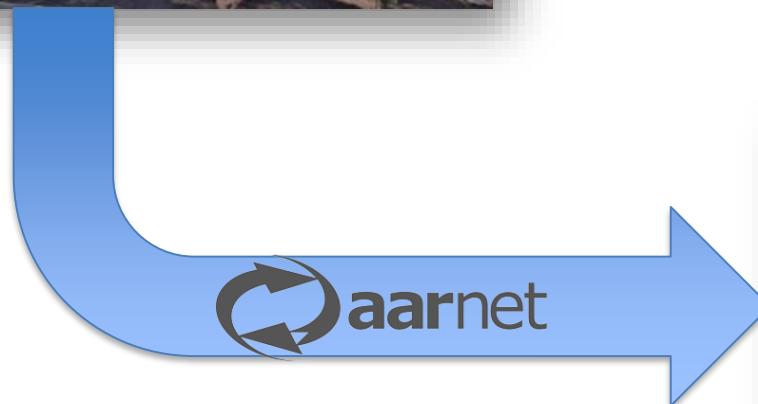
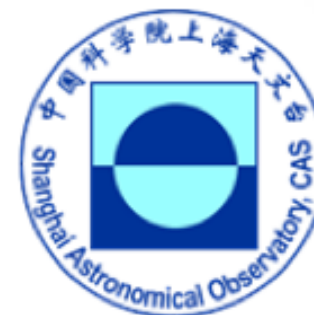
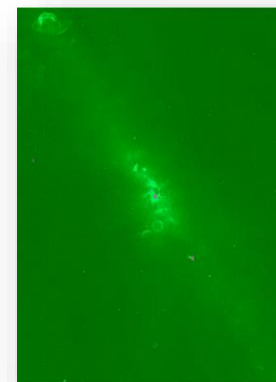
ICRAR – SHAO MoU



May 11, 2016

- Exchange of academic personnel for collaborative visits on data intensive astronomy;
- Workshops and conferences on SKA and data intensive astronomy;
- Co-supervision of PhD students on SKA Science Data Processor-related research projects;
- Planning of the setup and operations of SRC in the Asia-Pacific region.

MWA Galactic Centre Low Frequency Spectrum Lines



NGAS
DALiuGE

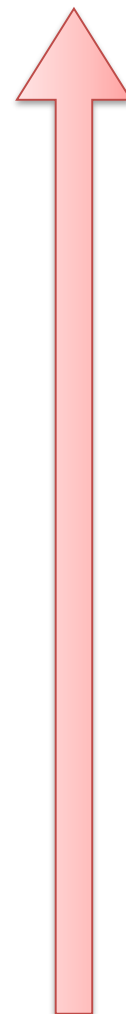
ERIDANUS

SKA-1 Scale

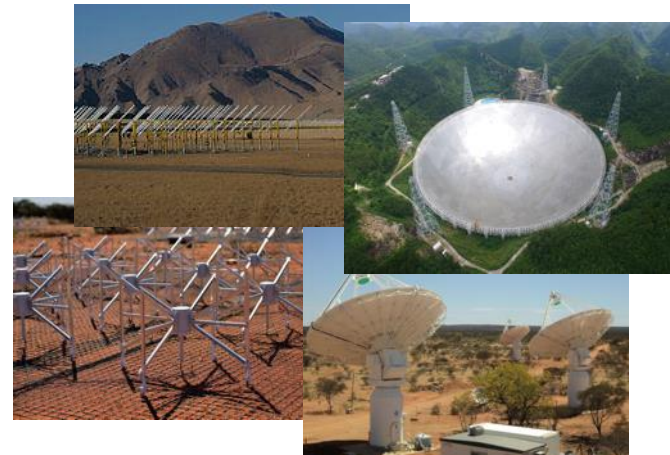
The ERIDANUS engages with:

- The astronomical communities within Australia and China
- Industrial partners
- The providers of networking and computing research infrastructure
- National and international committees coordinating efforts on SKA regional centre developments
- European SRC Project - Aeneas

Open invitation to join



**Technology
Development Projects**



**Precursor Science
Projects**

- end

Contact us:
slava.kitaeff@icrar.org
or
slava.kitaeff@csiro.au
<http://eridanus.net.au>

New Zealand

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Nyriad Creates Groundbreaking Technology for SKA

Monday, 10 April 2017, 7:30 pm

Press Release: **Nyriad**

For Immediate Release

Monday, 10 April 2017

Nyriad Creates Groundbreaking Technology While Assisting New Zealand and Australian Governments with Square Kilometre Array Development

Cambridge, New Zealand, April 10, 2017— The Square Kilometre Array (SKA) radio telescope is the world's biggest data problem. Nyriad (a New Zealand startup) has developed a breakthrough technology that promises to be the solution. ICRAR, the International Centre of Radio Astronomy Research, based in Perth, Australia, is working with Nyriad to adopt the technology for SKA.