

# Going coast to coast at the speed of light: continental-scale real-time radio astronomy



International Centre for  
Radio Astronomy Research

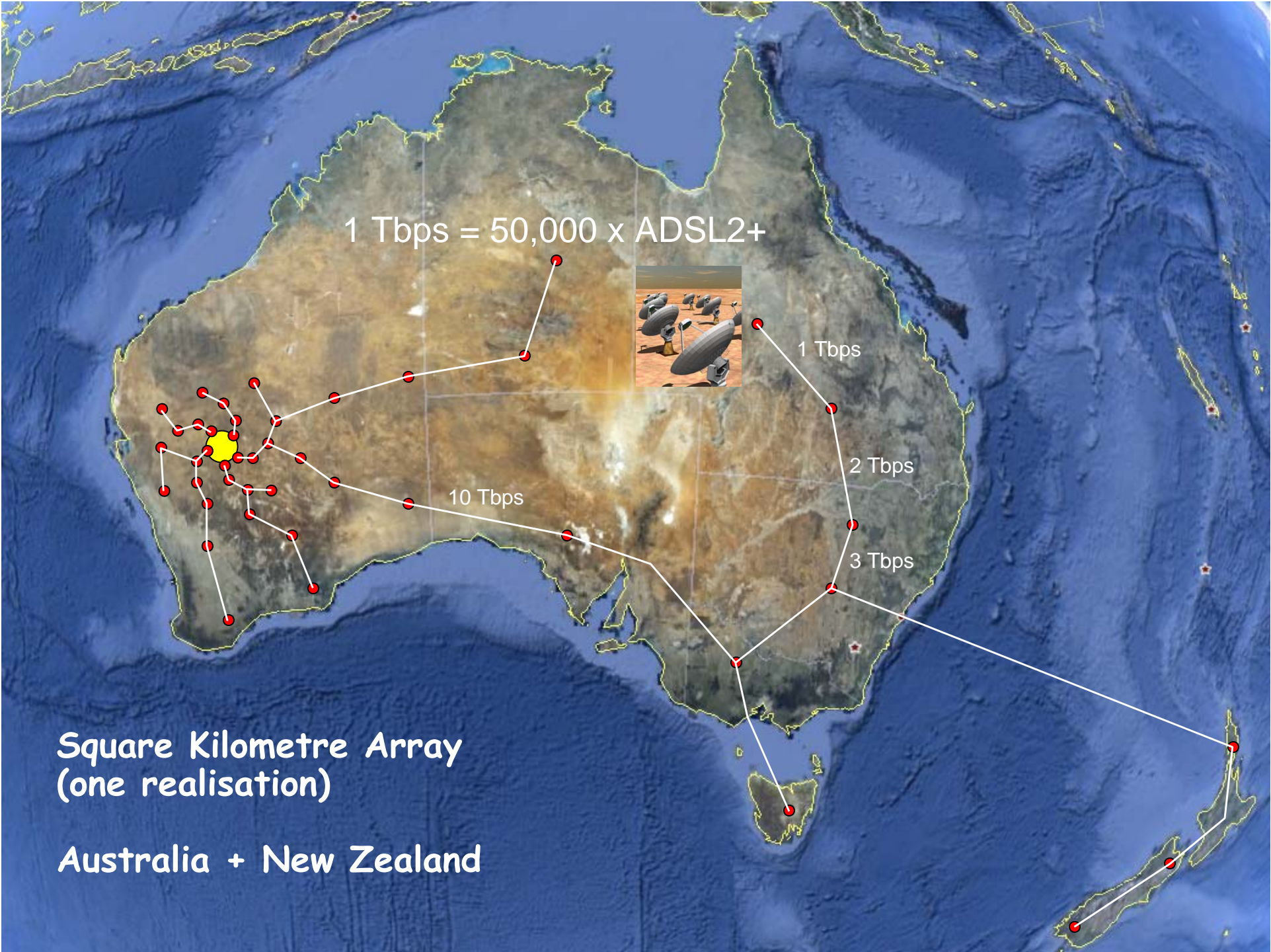
Prof. Steven Tingay  
ICRAR Deputy Director

ON BEHALF OF THE TEAM

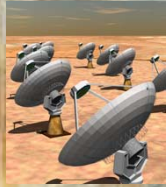


THE UNIVERSITY OF  
WESTERN AUSTRALIA





1 Tbps = 50,000 x ADSL2+



1 Tbps

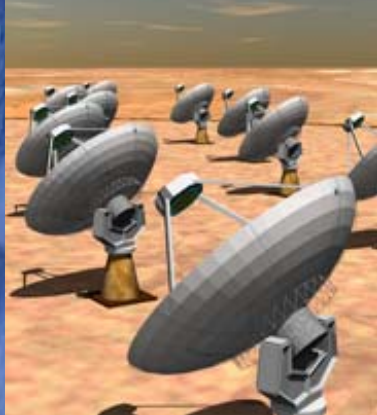
2 Tbps

3 Tbps

10 Tbps

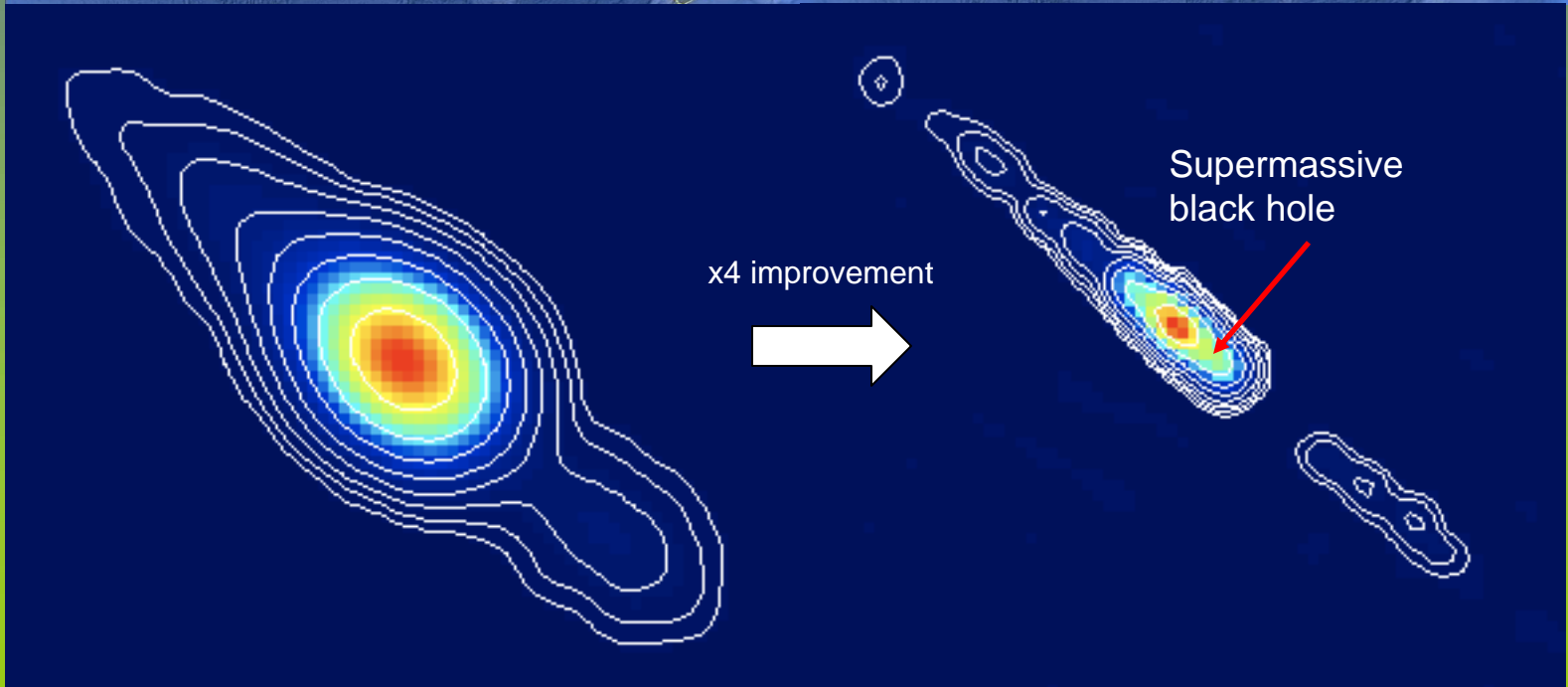
Square Kilometre Array  
(one realisation)

Australia + New Zealand

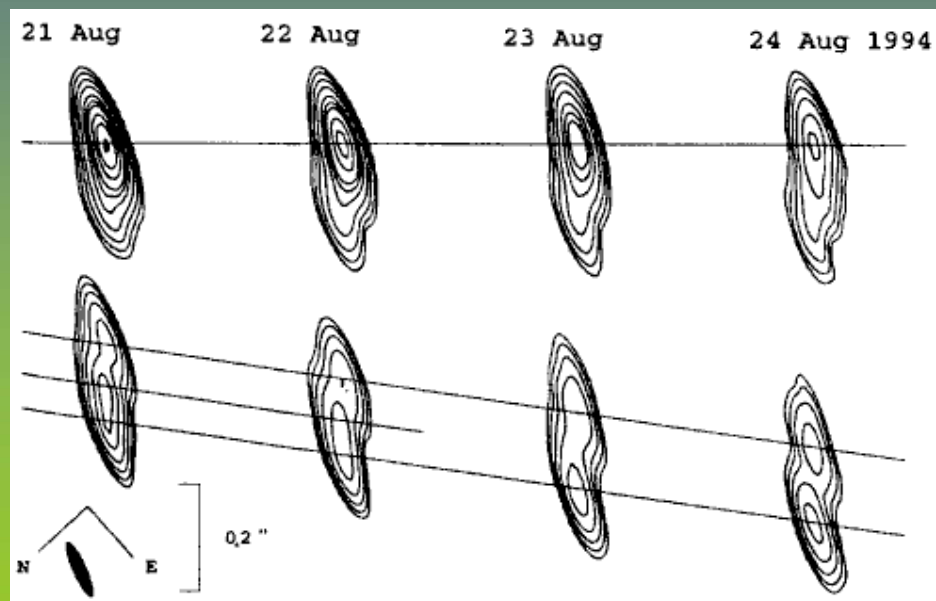


1 Gbps = 500 x ADSL2+  
10 Gbps = 5000 x ADSL2+





Dynamic allocation of telescope and network assets allows real-time reaction to rapidly evolving astrophysical phenomena:



Network transfer of data for real-time or near real-time processing is a lot cheaper than:

- 1) Recording to hard disk at telescope;
- 2) Handling and shipping at telescope;
- 3) Handling and playback at processor;
- 4) Erasing and recycling, shipping back to the telescope.

In Australia, we now use nationally funded data flow management teams [Australian Research Collaboration Service] to transfer almost all of our data for us, from telescope to processor, many terabytes per observing session, every ~3 months.

Save media costs [including failure and replacement], shipping costs, handling costs and reduced human error rate.

# Close collaboration with Europe

QuickTime™ and a  
decompressor  
are needed to see this picture.

EU funded programs EXPReS and NEXPreS have utilised real-time network transfer for radio astronomy. Australia major participants.

Next step is globally distributed and dynamically allocated telescope and computational assets, available to scientists on-demand.

# USA?

QuickTime™ and a  
decompressor  
are needed to see this picture.

- Great radio telescope assets;
- One of early movers in this field;
- Only just starting to address last mile problems;
- Would love to connect Australian and US telescopes to provide:
  - Better temporal coverage;
  - Higher resolution.

# Take-home messages:

Australia is leading the world in trans-continental radio astronomy (10 Gbps) - demonstrating Australia's path to SKA readiness:

- FACTORS OF 10 - 1,000 IMPROVEMENT IN FIBRE CAPACITY NEEDED;
- FACTORS OF 2 -3 IMPROVEMENTS IN FIBRE REACH REQUIRED;
- NATIONAL IT INFRASTRUCTURE [National Broadband Network].

Inclusion of ASKAP (and other existing antennas) will improve current array by a factor of four in image quality;

Collaborate internationally with New Zealand, China, India, Japan, Korea, USA, Europe, South Africa in global radio astronomy projects;

Would love to work more closely with US. But connectivity to telescopes the primary issue.