

# Grid Computing The Virtual Observatory

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# The Grid and Virtual Observatories

What is the Grid?

What is a Virtual Observatory?

International Virtual Observatories  
Alliance & Aus-VO

Radio Astronomy & VO

Service Description, Composition &  
Execution

It's not just Virtual Observatories...



# The Grid & eScience

Convergence of high-performance computing, huge data stores and high-bandwidth computing to:

- share resources

- (data/computation/instruments)

- enhance collaboration

- allow for new ways of conducting research



# Virtual Observatories & the IVOA

Global electronic access to astronomical data archives of space and ground-based observatories & sky surveys

Coordination data analysis using common standards, high-bandwidth networking & state-of-the-art analysis tools



# IT Challenges

Provide a uniform model of observational, derived and modelled data for an entire scientific discipline.

Provide a model of computation for tools used to reduce the data.

Allow for automatic, assisted and convenient manual assembly of data sources and tools.



# International Virtual Observatories Alliance

UK – AstroGrid

Australia –

Aus-VO

EU – AVO

China – ChinaVO

Canada – CVO

France –

VOFrance

Germany –

GAVO

Italy – DRACO

Japan – JVO

USA – NVO

Russia – RVO

India – VO-I

Korea – KVO

<http://www.ivoa.net/>



# Aus-VO Projects

HI Parkes All-Sky Survey

2QZ – spectroscopic quasar survey

MACHO archive

ATCA archive

Machine learning

SUMSS 843MHz southern sky survey

RAVE radial velocity survey

Remote Visualisation

<http://www.aus-vo.org/>

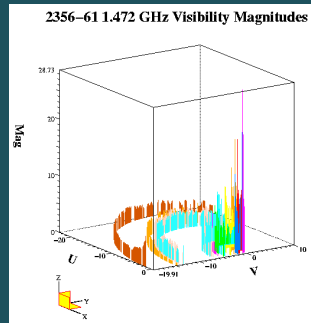


# Radio Interferometry Imaging

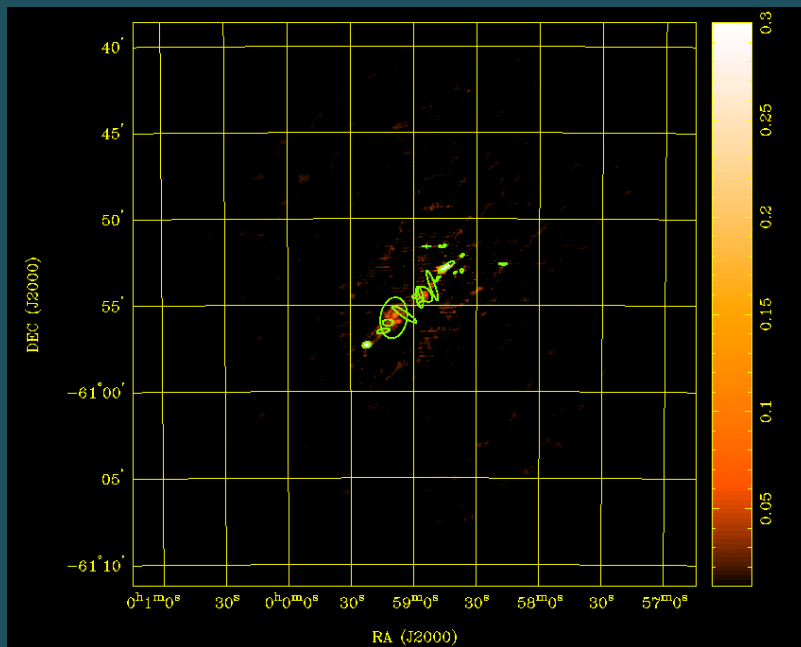
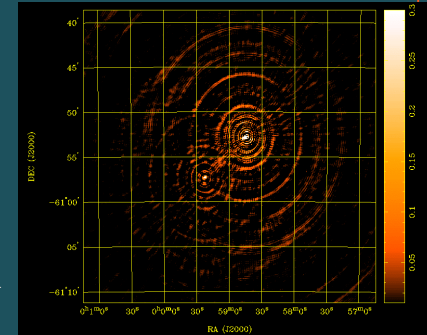
## Raw data to source extraction



Amplify,  
filter,  
correlate



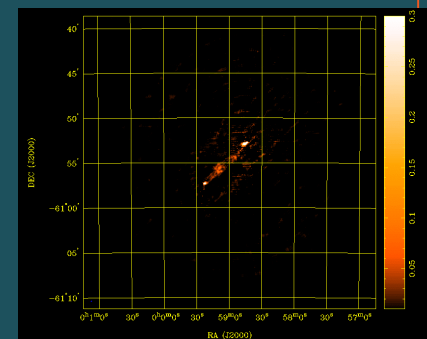
Calibrate,  
Inverse  
Fourier  
Transform



Many details  
omitted!

Deconvolve

Source  
extraction



# The Virtual Observatory is across the whole spectrum

Search optical VO data

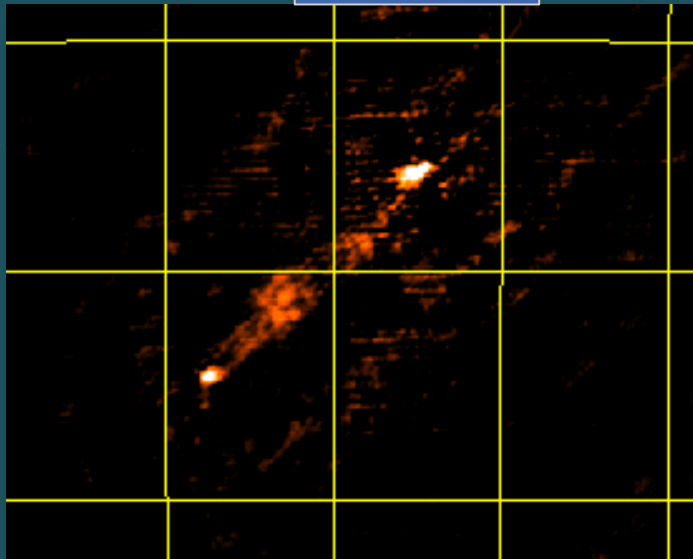
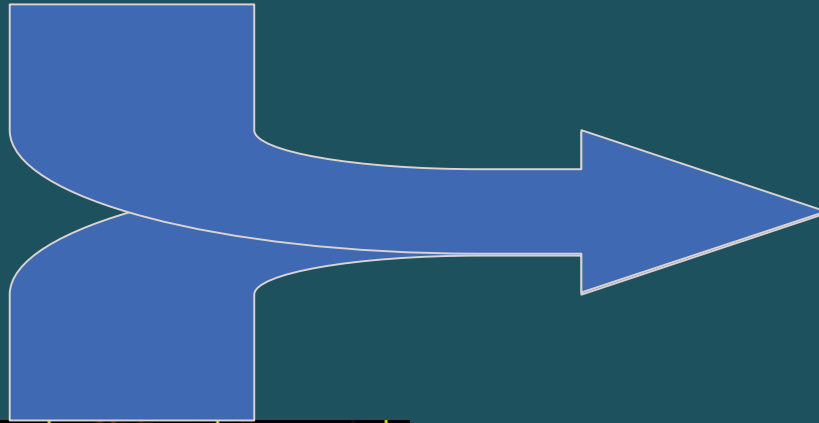


Image above: Copyright © 1995  
A. M. Koekemoer *et al.* Australia  
Telescope National Facility



# IT Demands

Large distributed database (ATCA  
data alone is ~1.8TB)

Need common data model

Need to

describe

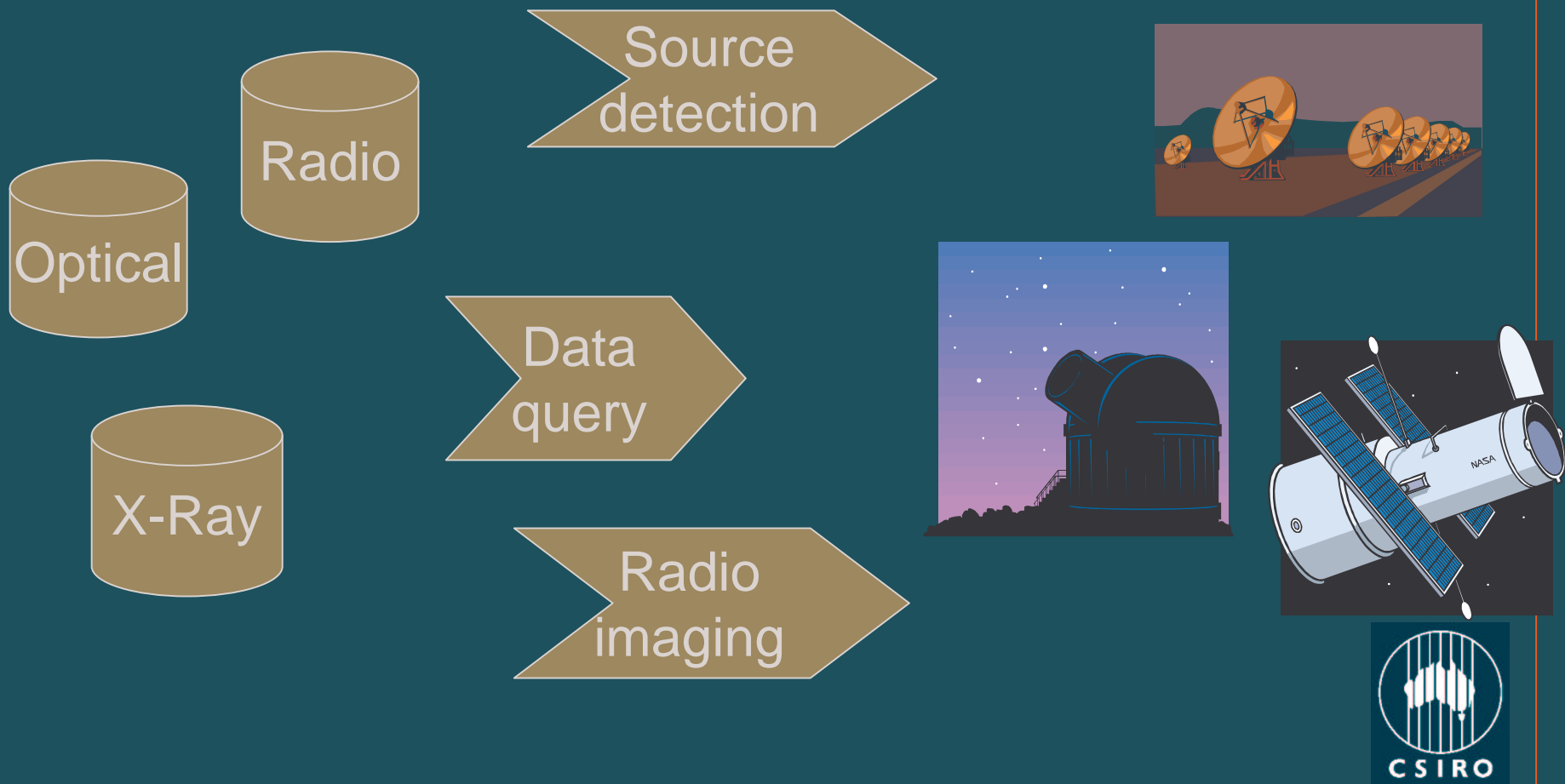
compose

execute

data queries and processing



# Service description

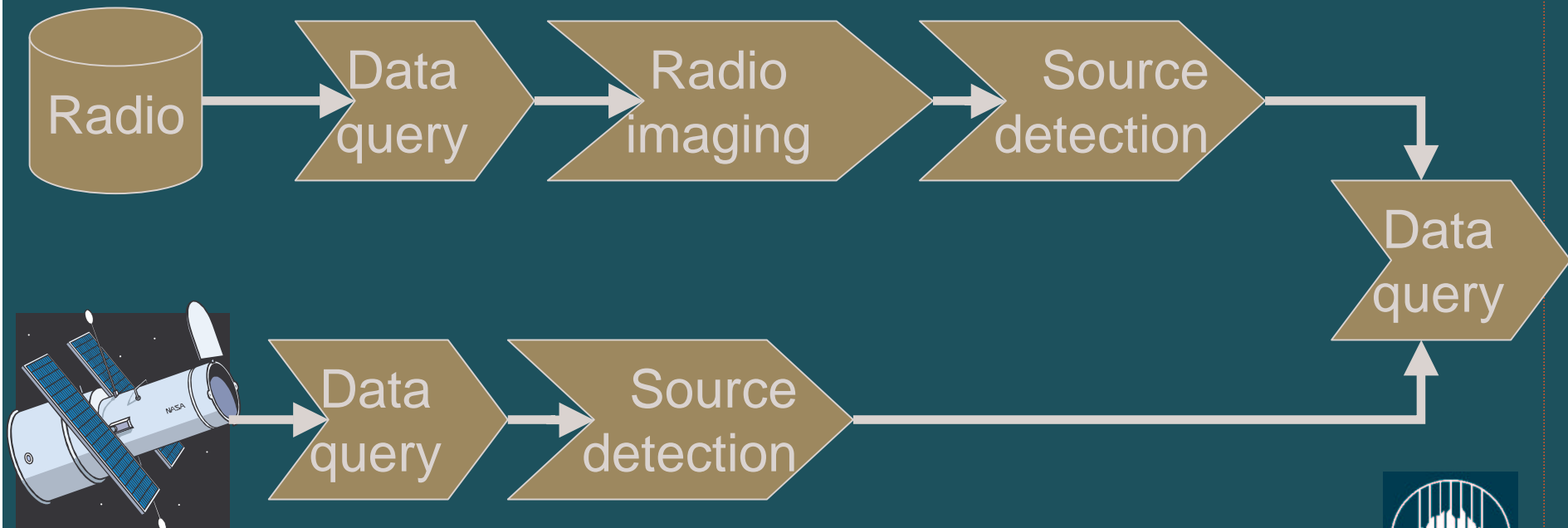


# Service composition

User task description

User constraints

Service composition



# Where we are

- Select an area of interest in the sky
- Assemble or acquire the data sets  
(does the data I need exist already)?
- Process/reduce
- Combine
- Analyse & check hypothesis
- Double-check data and processing
- ü Scientific results



# Where we want to be

State the data and processing  
*requirements*

Receive the data processed as  
needed

Check the hypothesis

Double-check the data and the  
processing

ü Scientific result; sooner & with less  
effort



# What's in the way

We have archives , not data access nodes

Many kinds of data: radio, optical, X-ray; images, spectra, polarisation maps

Much data processing/reduction needed to make inspection, search & fusion possible

Data treatment is a craft



# Directions

Complete metadata construction  
for Australia Telescope archive.

Paper trial of representative  
sample of existing service  
composition tools

Execution trial of reduced sample  
(no more than 2-3) composition  
tools



# Directions

## Extension or new work to deliver:

composition requirements and constraints

service discovery and testing

composition debugging and testing

service availability

resource optimisation

exception handling

and recomposition.



# Questions?

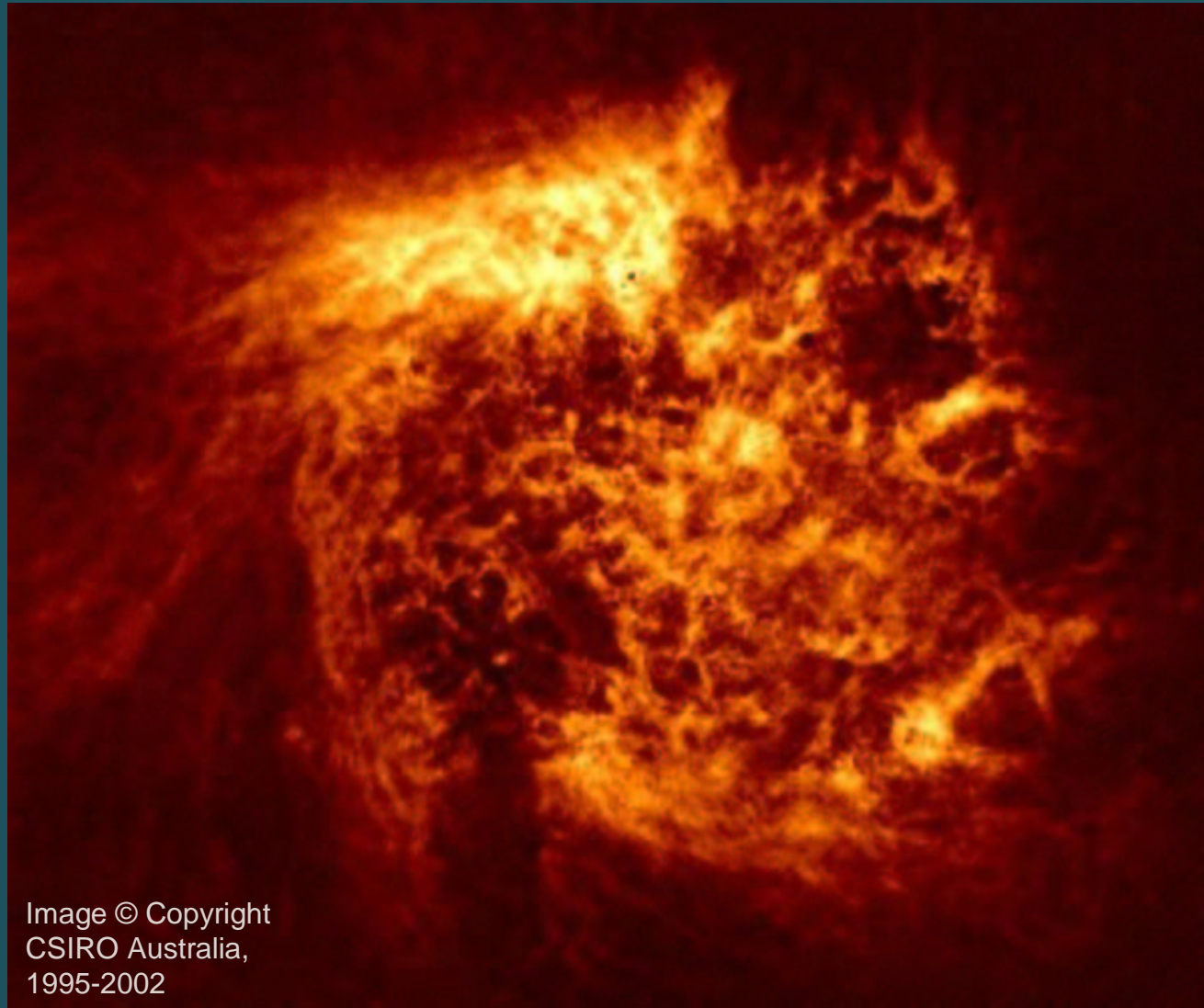


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