China: SKA Regional Centre

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Shanghai Astronomical Observatory
on behalf of SKA China team

A brief history of China's participation in SKA

SKA SDP Workshop

2016 May, in Shanghai

100+ researchers (20+ international), cross astronomy, HPC, industry

Sessions: SKA science, Regional Science Centre, Science Data Processor, and Prototyping

Shanghai Observatory first proposed SKA Asia Regional Centre concept in this workshop

P. Diamond - Director General:
Challenges: 1. data processing
2. synergistic support among members

SKA Asia Science and Data Centre

P. Gan - Vice director, Shanghai S&T Commission

- Shanghai is willing to be an important international centres of SKA research
- World-class **SKA science centre** is listed in the next five-year strategy plan of Shanghai city

- Shanghai ’13th Five-Year‘ strategy plan (2016-2020): support the building of SKA science centre

National Science and Technology “13th Five-Year” Plan (2016-2020)

Setting up SKA1 special funding

六大部署

三 拓展创新发展空间

打造区域创新高地，北京、上海建设具有全球影响力的**科技创新中心**，建设创新型省市和区域创新中心，打造**“一带一路”**协同创新共同体，全方位融入和布局全球创新网络

专栏22　国际大科学计划和大科学工程

1.国际热核聚变实验堆（ITER）计划。全面参与ITER计划国际组织管理，提升我国核聚变能源研发能力；以参加ITER计划为契机，带动更多国内相关机构参与国际研发，提升我国参与大科学工程项目管理的能力，树立我国参与国际大科学工程项目管理的典范。

2.平方公里阵列射电望远镜（SKA）计划。积极参与SKA计划政府间正式谈判，继续深入参与SKA国际工作包研发并确保我国工业界在SKA—1建设中的优势地位，在国内部署开展科学预研及推动设立SKA—1专项。

3.地球观测组织（GEO）。构建综合地球观测领域全球合作体系，主导亚洲大洋洲区域全球综合地球观测系统（GEOSS）的建设，运行我国全球综合地球观测数据共享服务平台，向全球发布专题报告。选择“一带一路”区域开展遥感产品生产与示范应用。

4.国际大洋发现计划（IODP）。瞄准国际前沿科学问题，验证大陆破裂形成海洋的重大理论假说，解决南海北部油气勘探开发中的关键问题。创新参与模式，提高我国的主导作用。

SKA Asia Regional Centre and international collaborations

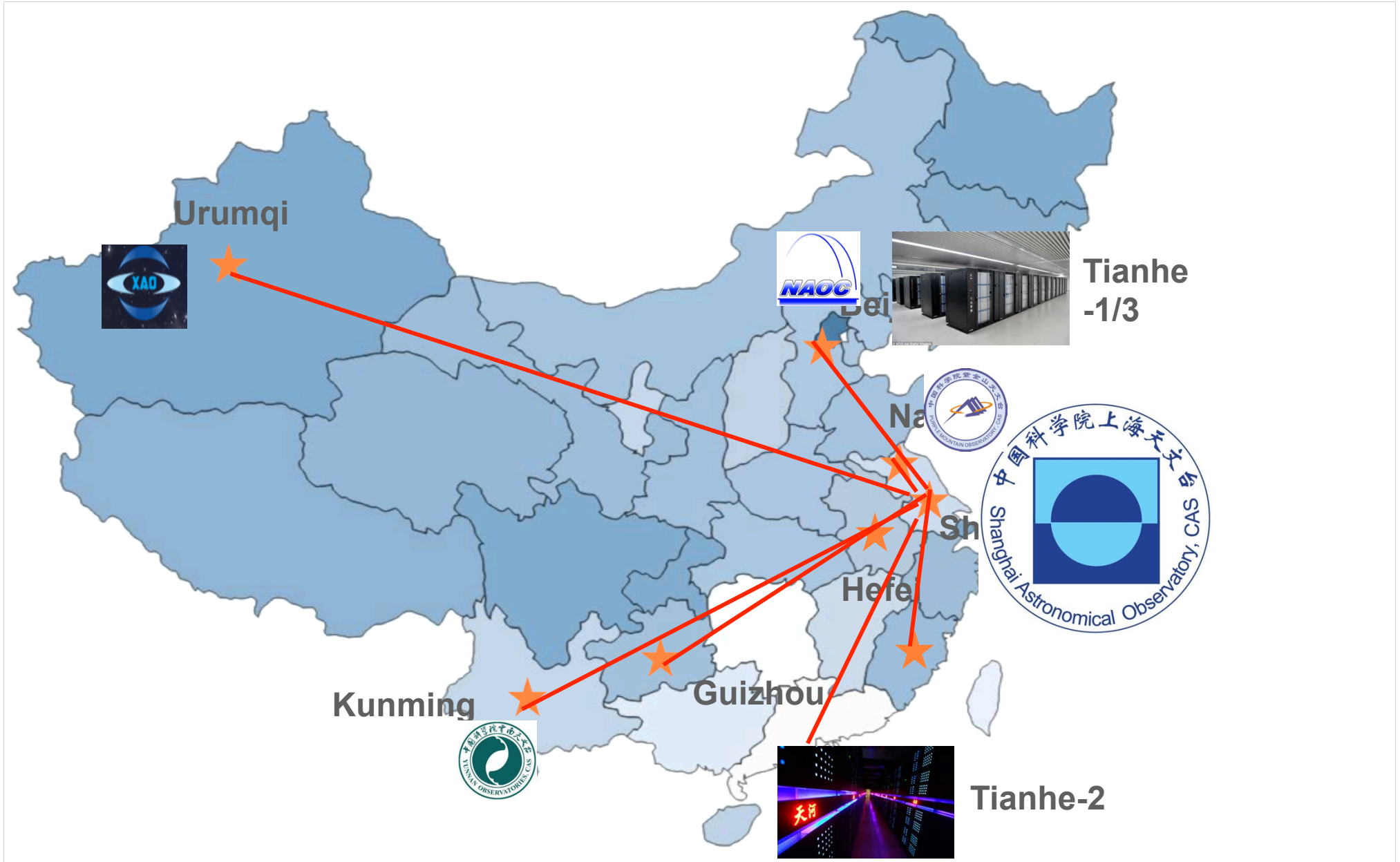
ERIDANUS
Exascale Research Infrastructure For Data In Asia-Pacific Astrononomy Using The SKA

CH-AU: Asia-Pacific Regional Centre (led by ICRAR and SHAO)

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

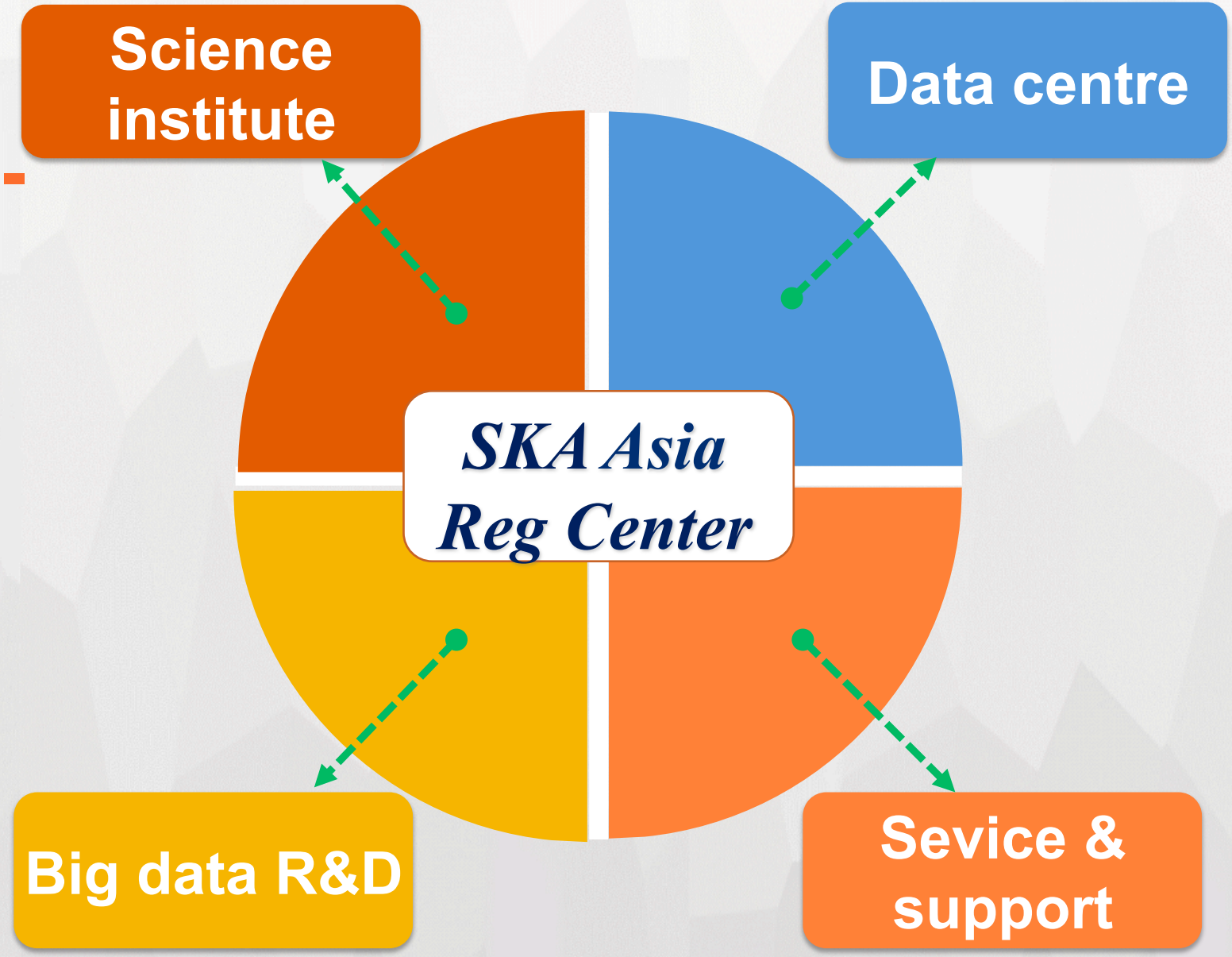
CH-EU Regional Collaboration (to be planed)

China: SKA Science and Data Network

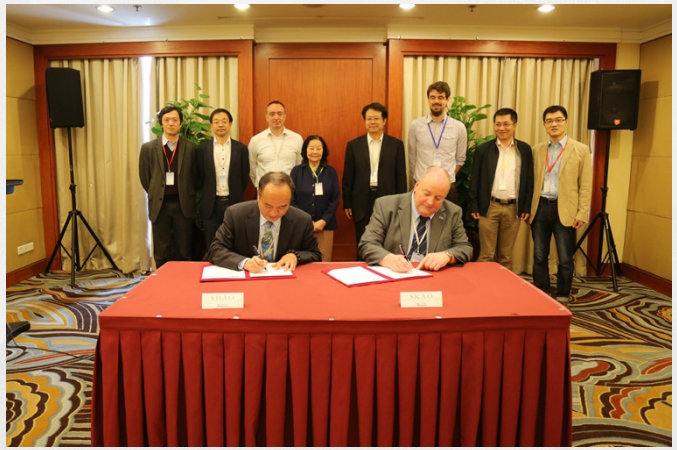


SKA Asia Regional Center - Functions

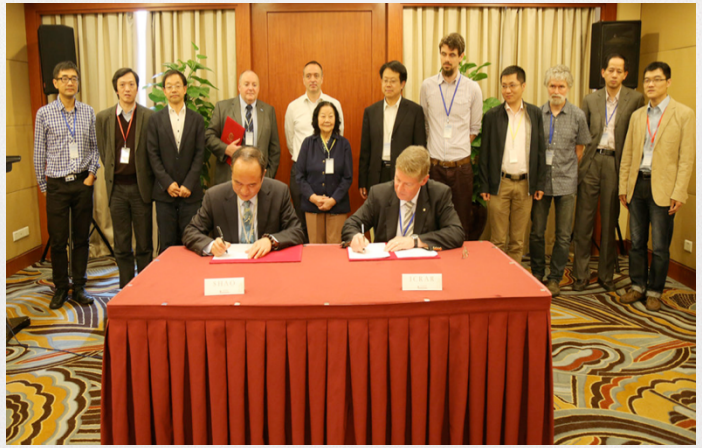
In collaboration with Asian countries and regions, including India, Japan, Korea, Taiwan … to foster the SKA research in Asia



Preparation of SKA Asia Region Centre

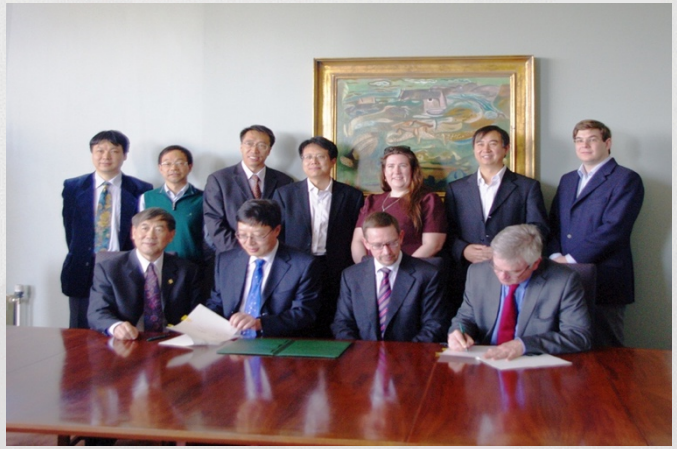


SKAO - SHAO MoU



SHAO - ICRAR

SHAO - Inspur (IT company)



NAOC - New Zealand

NAOC- South Africa

NAOC - AU

Precursor Cooperation

China + Australia

MWA
MURCHISON
WIDEFIELD
ARRAY

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Chair, Murchison Widefield Array Executive Board
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Melanie.Johnston-Hollitt@vuw.ac.nz

6th of November 2014

Prof. Xiang-Ping Wu,
Director, 21 CMA Project,
National Astronomical Observatories,
Chinese Academy of Sciences

Dear Xiang-Ping,

RE: Murchison Widefield Array Phase 2 expansion and operations

I am writing to you as the nominated institutional contact for a Murchison Widefield Array (MWA) partner organisation, or the contact at a potential new partner organisation. To date, the MWA has been a phenomenally successful instrument producing 21 refereed publications in less than 2 years, with another 27 currently in collaboration review, journal review, or preparation. Thousands or hours of observing and more than 3 PB of data have been collected since operations commenced in mid-2013. Much of the planned science for the MWA is starting to come to fruition and unexpected science is rapidly emerging.

The Statement of Intent to operate the MWA within the current collaboration expires in Q1 2017 and current operations funding is expected to concluded in mid-2016 (from Australian NCRIS funding). The future of the telescope beyond mid-2016 now needs to be defined and the MWA Board is in the process of developing a two stage upgrade path for the array. The first stage (Phase 2 MWA) is planned to consist of a doubling of the number of tiles in the array, from 128 to 256 (with 128 correlated at any given time), to facilitate longer baseline science and an enhanced Epoch of Reionisation observation capability. This Phase 2 extension would be expected to be complete by the end of 2016 and operate through the end of 2018. A Phase 3 upgrade would involve full replacement of the analog and digital signal paths and full 256 tile correlation, expected to be complete by mid-2018 and commence operations at the

ACAMAR established in 2015.9

SKA + FAST + The South Pole Observatory

Has held the two session

Substantive cooperation between the two sides

SHAO to join MWA to strengthen **21CMA-MWA** cooperation

MWA: 80MHz – 300MHz, Baseline 3km

21CMA: 50MHz – 200MHz, 6km*4km

Domestic SKA-related fundings

	Project	Funds M Euro	Resource	Institutions
1	SKA pre-construction and preparation	~3 M	Ministry of Science and Technology (MOST)	NAOC, CECT-54, SHAO, SJTU …
2	Science and key technologies of SKA in preparation stage	~3 M	Chinese Academy of Sciences (CAS)	NAOC, CECT …
3	Design study of large aperture antenna	~1 M	Ministry of Science and Technology (MOST)	CECT-54
4	SKA Antenna Technology	~1.4 M	Ministry of Science and Technology (MOST)	CECT-54, NAOC
5	**SKA International Collaboration in Science and Engineering**	~8 M	Ministry of Science and Technology (MOST)	CECT-54, CECT-38, SJTU, FDU, NAOC , SHAO ,…
6	**Special funding of Gravitational Wave detection with PTA and SKA precursors**	~ 5 M	Chinese Academy of Sciences (CAS)	NAOC, SHAO, YAO, XAO, USTC, PKU, BNU …

completed

Newly funded

SKA China: Kickoff Science Working Group

- SKA Science White Book
- Major science subjects:
  - Neutral Hydrogen for studies of EoR, dark energy and cosmology、dark matter
  - Pulsars and relevant fields, including Pulsar searching、compact star and gravitational force、gravitational wave、cosmic magnetism
- Other subjects：Astrometry、Radio transients、Supernovae remnants and Cosmic Rays ……

Chief Scientist: Xiangping Wu

Consultant: Shuhua Ye

SKA science working groups:

140+ Astronomers from **20+** institutions

SKA China Science workshop
2016, Dec 18-20

SKA SDP China Engineering Consortium

Founded at Jan. 2013

China National A.O

China Inst. Comp. Te.

Shanghai Jiao Tong Univ.

Fudan Univ.

Shanghai A.O.

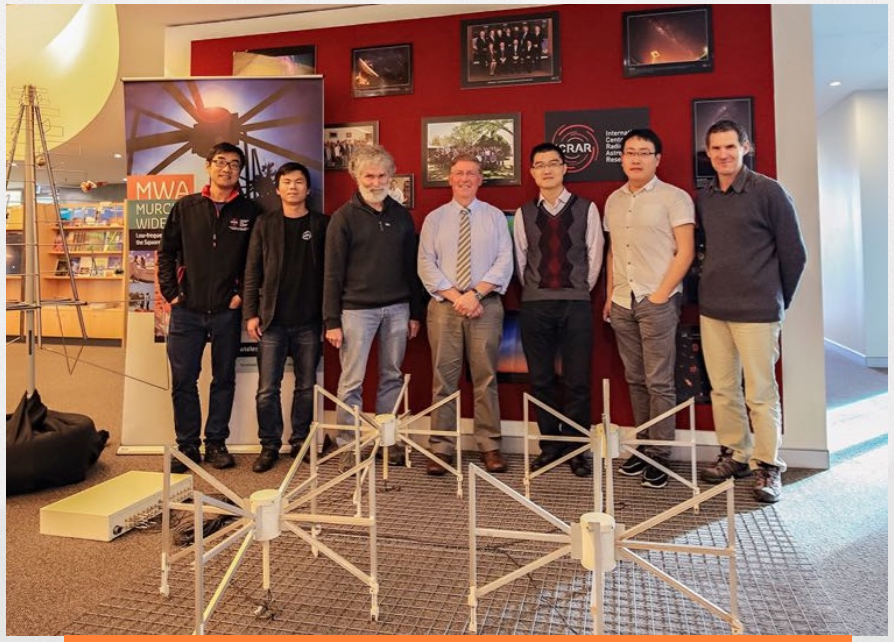
Sino-UK Joint lab of Henan Prov.

K. S. T. Univ.

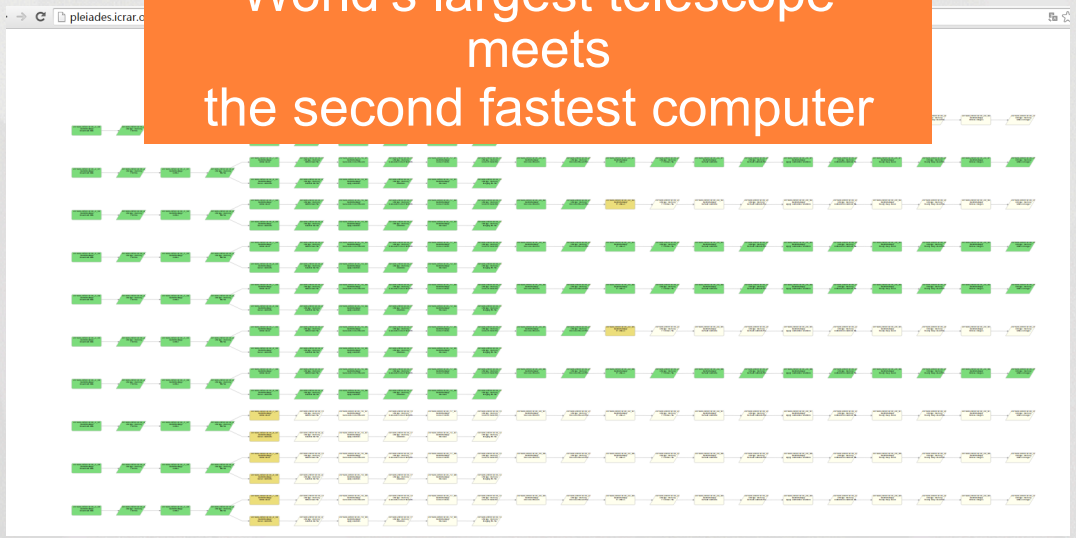
Total researchers: 77
Faculty & Eng: 50
Students: 100+

Prototyping: SKA data flow management

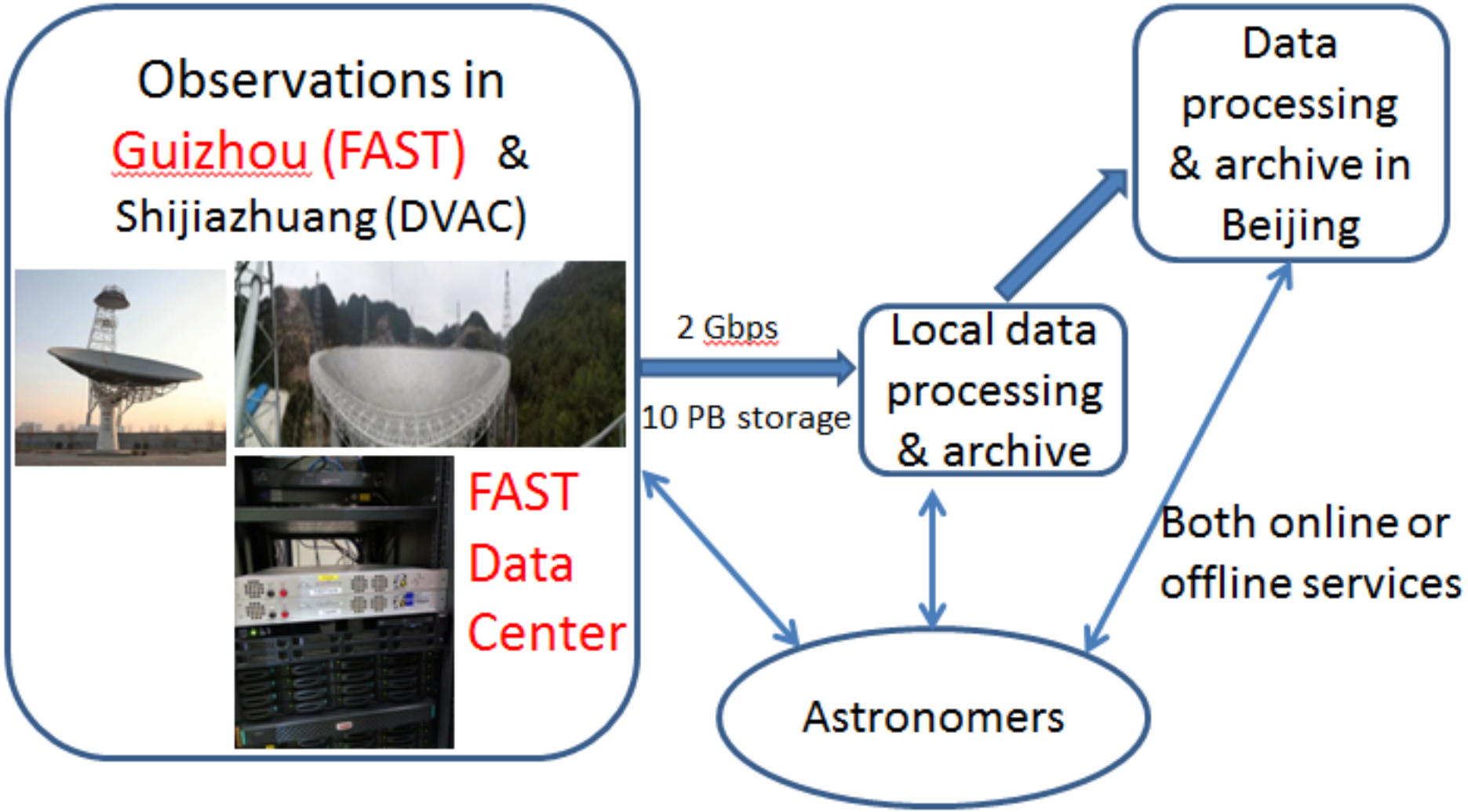
- Execution framework deployed on Tianhe-2 1500 nodes, multiple computing islands, verifying the scalability of DALiuGE to 10 million tasks/drops => first-time large-scale SDP test, strong supporting for further integration and prototyping
- SHAO SKA team awarded 2016“Milky Way Star”
- Data-Activated Flow (流Liu) Graph Engine (DALiuGE) – Australia-China collaboration !



World’s largest telescope meets the second fastest computer



NAOC FAST Data Flow



Simplified schematic illustration of the interactive data distribution model in NAOC

SKA Asia Regional Centre

I 2016-2017

SDP Prototype studies

Verify SKA key technologies, yield a reasonable evaluation of the

9

e of SKA precursors

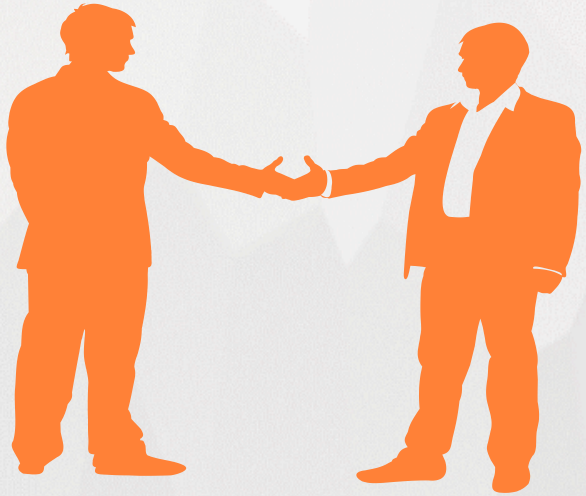
WA, ASKAP, MeerKAT…)

ata analysis, pre-research,

g

l Euro

Looking forward to close collaborations!



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