Indian participation in the SKA

A summary of activity during 2009-2014

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ASI Annual Meeting

Outline

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- 2017-2020 Construction of phase 1
- 2021– Operations of phase 1

2007–2012 PrepSKA

EU funded project to fund development of the SKA concept design. Work was partitioned as *work packages* into various obvious divisions of the telescope - dishes, low frequency aperture arrays, signal transport, signal processing, science data processing etc.
In parallel, efforts in the USA and Canada were funded through their own national programs.
The SKA Program Development Office (SPDO) was set up at the University of Manchester to coordinate this multinational effort.

Two phases

Around 2011, it became clear that due to funding and technology constraints, SKA needed to be built in 2 phases, with phase 1 having about 10% of the SKA collecting area.

Site decision

Around 2006, two sites - one in SA and the other in Australia were shortlisted for the SKA site. In 2012, after a lot of site study, discussion, analysis, argument and political lobbying a decision was made to use both sites.
In SA, we will have the mid-frequency dishes (SKA-Mid), which will grow out to the full array in phase 2. The dense aperture arrays will be constructed in SA but only in phase 2, since the technology is not ready in time for phase 1.
In Australia, we will have the sparse aperture array (SKA-Low), which will grow out to the full area in phase 2. In addition, more dishes will be added to ASKAP to form the SKA-Survey telescope.
Effectively, the SKA is now 4 telescopes, with 3 of them to be built in Phase 1!

SKA Organisation (SKAO), a company limited by guarantee

In 2012, the project invited bids for hosting the Project office. University of Manchester won out and a new SKA headquarters was built at Jodrell Bank.
The SPDO morphed into SKAO which is a registered in England and Wales as a company limited by guarantee.
The organisational structure also changed considerably. Prof. Phil Diamond became the Director General of SKA.

Countries signed up as members of the company

and their representatives became members of the SKA Governing Board. The following countries have signed on to date: Australia, Canada, China, Germany, Italy, Netherlands, New Zealand, South Africa, Sweden, UK. India is an associate member.

The governing board is the top decision making body for the SKA and includes representatives from both the astronomy community and funding agencies.

Indian involvement

started in a serious way towards the end of 2009. Through 2010, NCRA contributed to the Monitoring and Control system, since that was something we were already working on for GMRT.

In late 2010, we were asked by the office to take over as Lead Organisation for the M& C concept design work. We accepted and through 2011, we worked vigourously on this and produced a series of documents for review by an international panel of experts.

The M& C Concept Design review

was held at NCRA, Pune in Nov. 2011. The international review panel was chaired by Prof. Jonathan Lister who led the design effort of M&C system of the ITER fusion reactor.
The review was very successful and we were ready to move to the next phase.

Academic partnership with TRDDC

From the beginning, we have had a fruitful **research collaboration** with the Tata Research, Design and Development Centre (TRDDC), the research wing of TCS. Scientists from the Systems Research Lab of TRDDC bring engineering expertise which is complemented by the astronomy and radio telescope design and construction expertise at NCRA.

Industrial partnership

During the concept design phase we worked with two industrial partners - Embedded Computing Machines (ECM) and Persistent Systems Ltd. (PSL).
The SPDO strongly encouraged collaboration with industry. We were one of the few groups working with industry from the beginning.

RRI

is a partner in the MWA project which is one of the precursors of the SKA. They are involved in construction of digital receivers and firmware development for these receivers. Their expertise and interest is in science with low frequency aperture arrays.

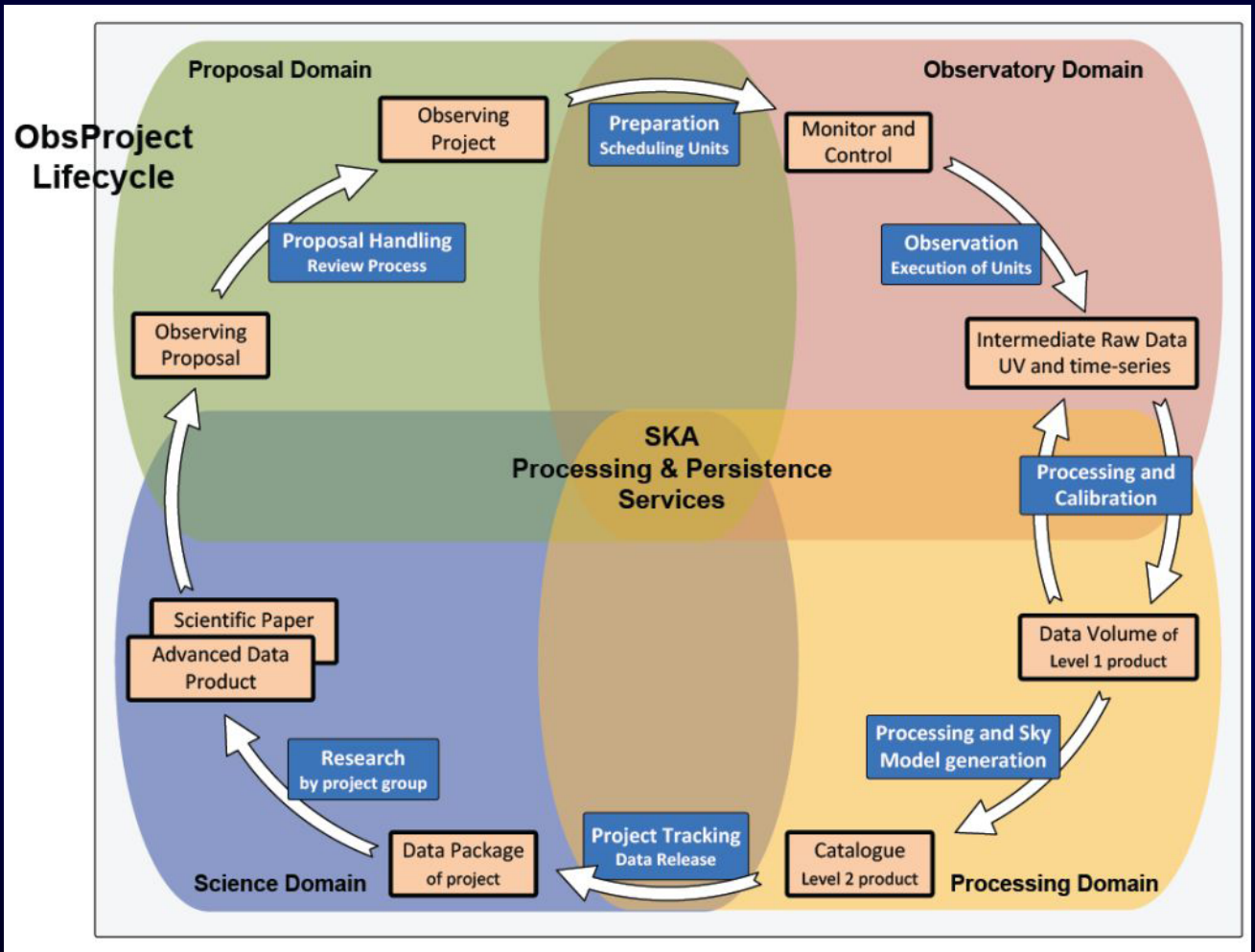
2013 onwards - the present phase

In April 2013, the SKAO issued a RfP for work to be done leading to a Preliminary Design review (end of 2014) and a Critical Design review (end of 2016).
In June, NCRA submitted a bid for design of the “Telescope Manager” a consortium with Astronomy Technology Centre, STFC (UK), CSIRO Astronomy and Space Science (Australia), GTD GmbH (Germany), Instituto de Telecomunicacoes (on behalf of the Portuguese ENGAGE-SKA Consortium) (Portugal), Instituto Nazionale di Astrofisica (Italy), National Research Council of Canada (Canada), SKA South Africa (South Africa), Tata Research Design and Development Centre (India).

Telescope Manager = (M& C)++

- M&C System
- Observer/Engineering/Scientist user interfaces
- Observation management - scheduling.

Observatory Data Lifecycle Diagram



Bid acceptance and MoU

In November 2013, a formal MoU was signed between the SKA Organisation and our consortium and formal work commenced. We are currently working vigourously towards a PDR later this year. The next stage last two years and will culminate in a CDR, which if successful will result in a construction data pack. By early 2015, the design will be re-baselined. Our work will contribute to this.

Industry partners for the preconstruction phase

- Tata Consultancy Services
- Persistent Systems Limited

The Telescope Manager Executive team

- Yashwant Gupta (NCRA-TIFR) - Consortium Lead

- N. Swaminathan (TRDDC-TCS) - Project Engineer
- Paul Swart (SKA-SA) - Systems Engineer
- Vinod Sathe (TCS) - Project Manager
- Yogesh Wadadekar (NCRA-TIFR) - Project Scientist

+ a team of about 35 people in 7 countries together contributing about 25 FTE/year of effort. About 60% of the effort is from India.

We are also involved

in a much smaller way with the Signal and Data Transport (SaDT) and Central Signal processing (CSP).

2017 onwards: The construction phase

Once the detailed design is done and the full telescope blueprint is ready, construction will be carried out via large industrial contracts. Exact model on how these industrial contracts will be awarded is still to be worked out.
The international academic partnership will still continue to play a leading role in bringing all the industry supplied pieces together into a coherent radio telescope.

Phase 2

- the design of SKA Phase 2
- construction of SKA Phase 2
- the operations phase, lasting 5 decades (design lifetime).

The SKA website

http://www.skatelescope.org