



Developing a prototype SKA Regional Centre in India: Challenges and opportunities

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The Square Kilometre Array (SKA) Observatory will generate unprecedented volumes of astronomical data (~700 PB/year), necessitating a global network of SKA Regional Centres (SRCs) to process, store, and analyze these data. We outline plans for developing a prototype SRC in India as part of the international SRC network.

The SRC network faces several major challenges:

1. Scale: Processing and storing 600-700 PB of data annually requires exascale computing capabilities beyond current astronomical data centers.
2. Distribution: SRCs will be geographically dispersed yet must function as a unified system, demanding sophisticated data management and transfer protocols.
3. Interoperability: Software and hardware across SRCs must be compatible to enable seamless data access and processing for users worldwide.
4. Networking: High-speed (100+ Gbps) intercontinental network connections are needed between SRCs and telescope sites.
5. Governance: As independently funded entities that are essential for SKA science, SRCs require a novel organizational structure for effective coordination.
6. User support: SRCs must provide training and assistance to astronomers adapting to this new paradigm of data-intensive radio astronomy.

To prepare for these humongous challenges, India proposes building a proto-SRC with ~10 PB storage and ~20 TFLOPS compute capacity. This will allow evaluation of emerging technologies, development of data processing pipelines, and gaining of operational experience. The proto-SRC will analyze data from SKA pathfinders and support simulations for SKA science.

Key areas of focus include implementing tiered storage solutions, optimizing GPU/CPU configurations, ensuring high-speed connectivity via the National Knowledge Network, and collaborative open-source software development. Industry partnerships will be crucial both for hardware provisioning/maintenance and software development.

By participating in the international SRC development effort, India aims to contribute to and benefit from advances in Exascale computing that will have wide-ranging impacts beyond astronomy. The proto-SRC will pave the way for constructing a full-scale SRC in India synchronized with SKA operations, enabling Indian astronomers to fully exploit this next-generation telescope.

References:

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