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SKAO Regional Centre United Kingdom

SRC | Net

SKAO Regional Centre Network



UK SKA Regional Centre -

What SKA Science Needs — And What It Can't Get Today

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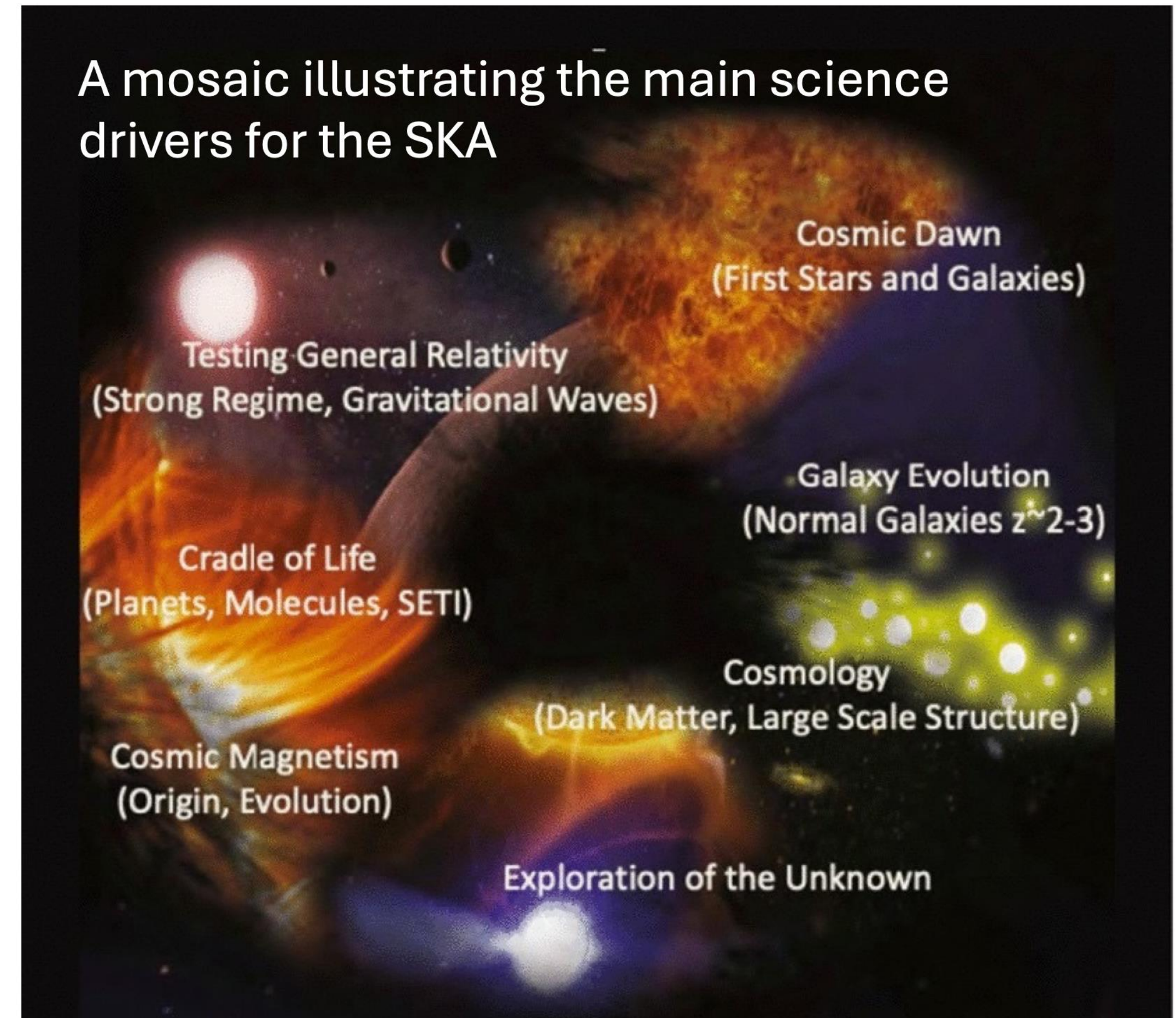
on behalf of the full UKSRC team

Square Kilometer Array: Transforming radio astronomy

The Square Kilometer Array (SKA) Observatory (SKAO) is a next-generation radio astronomy facility which will cover the frequency range from 50 MHz to 15 GHz.



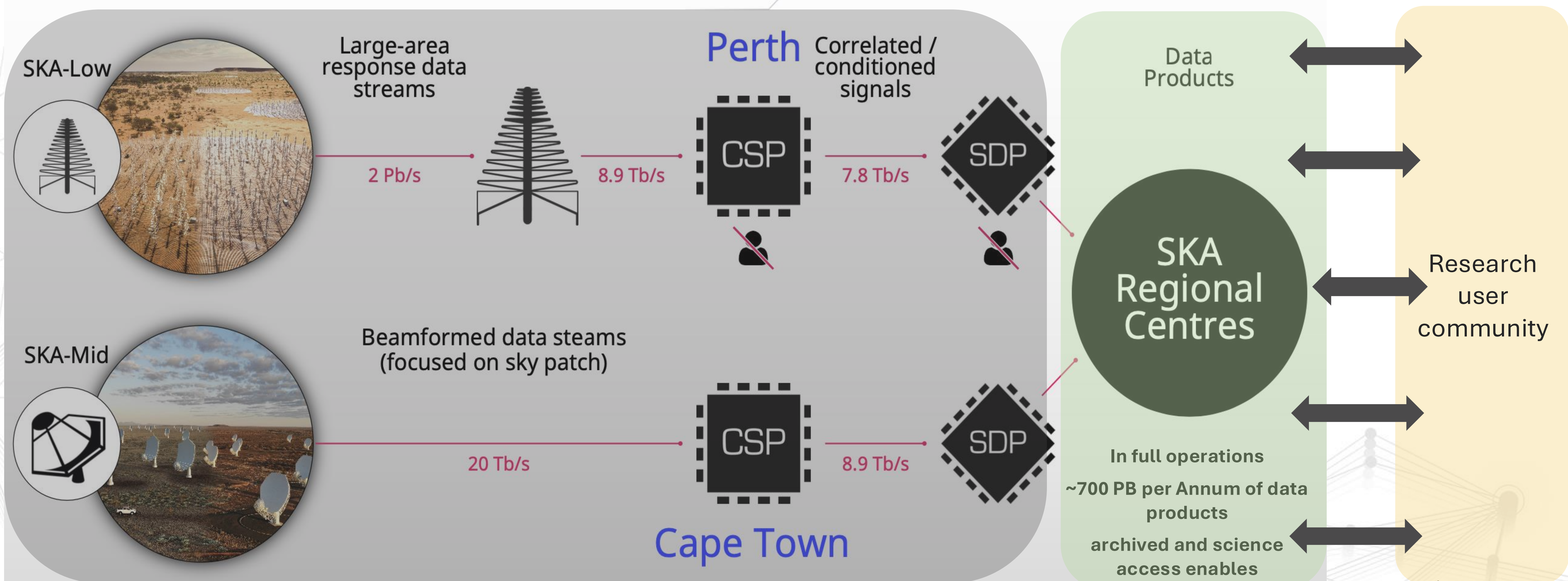
Composite image of the SKA telescopes, blending real hardware already on site with artist's impressions. credit: SKA Observatory



Credit: SKA Observatory

From telescope to user – central role of the SRCNet

Exabyte-scale data challenge - federated global solution.



Data rates/volumes are subject to change as the systems and projects are refined

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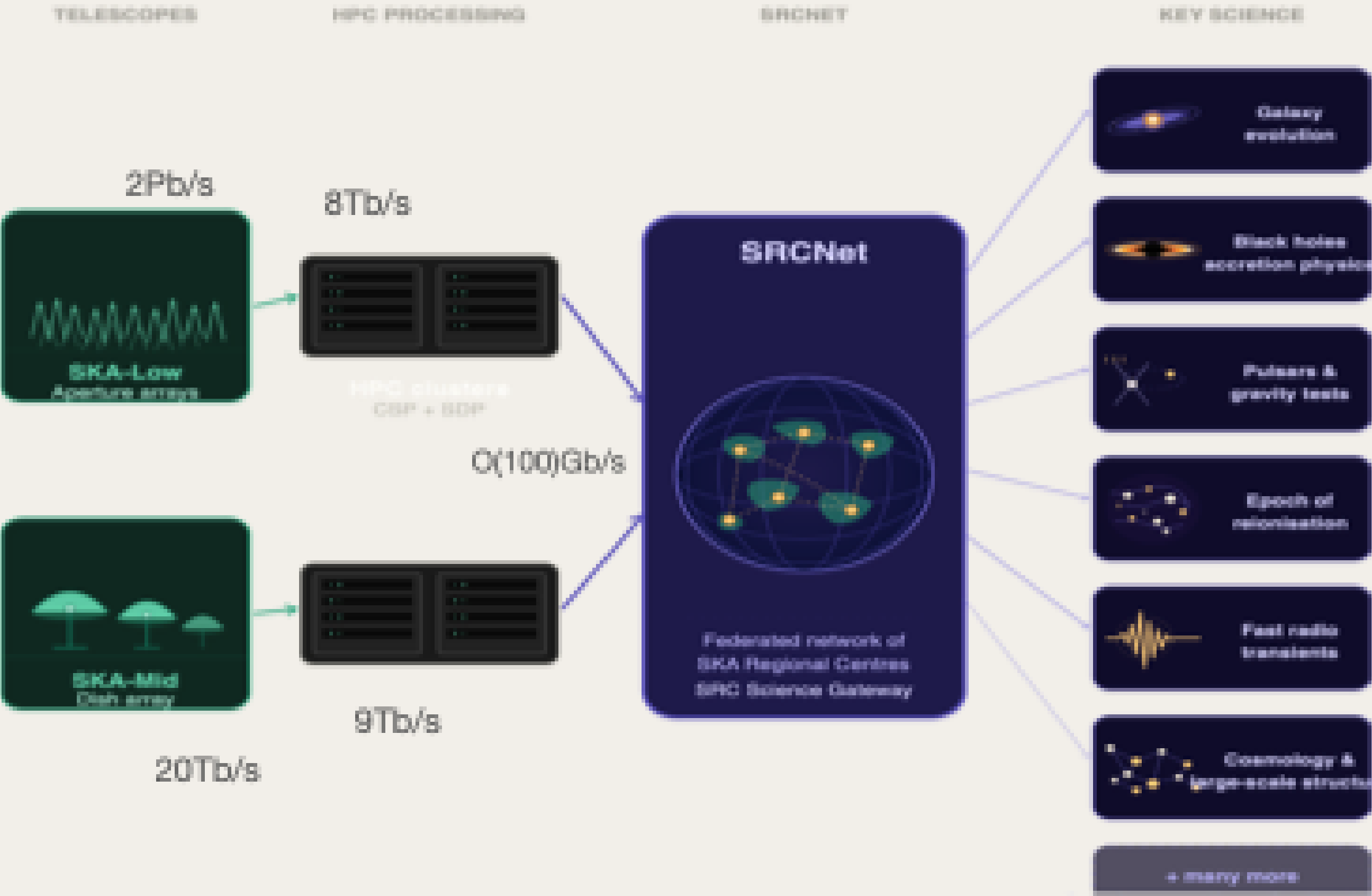
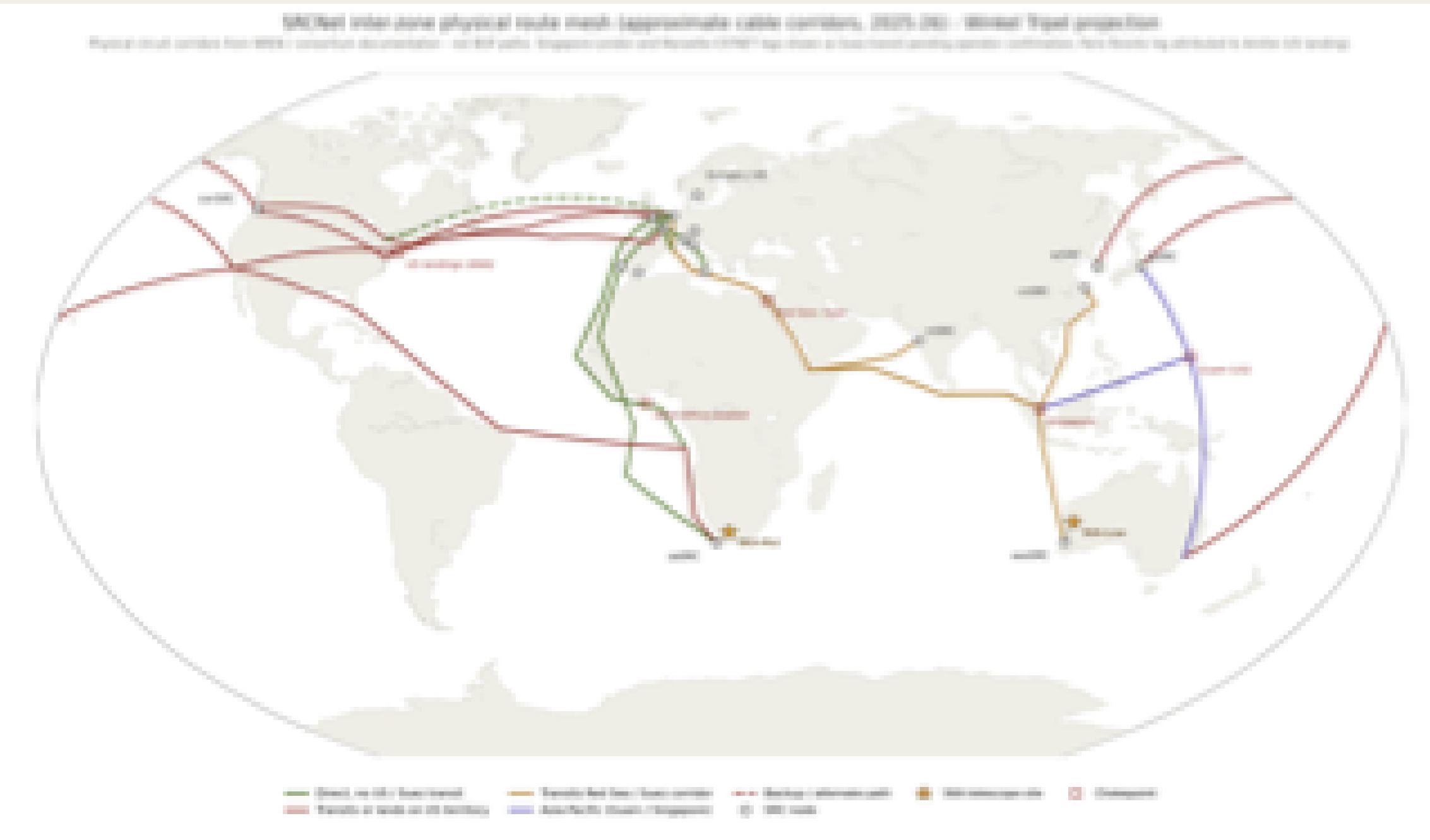
SRCNet and its place in SKA and Radio Astronomy

SRCNet IS the system by which Users will access SKA data and run compute, and to provide the long-term archive



The challenge:
2 Telescope sites
True global coverage:
~ 6 Zones

Country fractions; assuming their proportion of construction share



UK's SKA Regional Centre (ukSRC)

A facility for the UK radio astronomy community:
Enabling UK science community to lead the exploitation of SKA data
Maximising the UK's return on the UK's SKAO investment.

UKSRC infrastructure and services:
Supporting and facilitating UK science



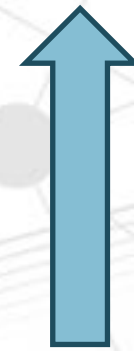
Global SRC Network:
Developing and delivering the global SRCNet.



ukSRC turns infrastructure investment into UK scientific capability

...essential added value for the UK. Key services beyond SRCNet.

Common/global Science support (MVP)



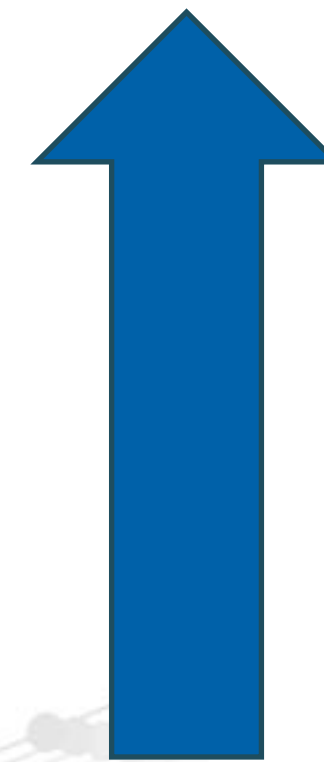
Globally federated services

...essential national infrastructure needed for UKSRC (& SRCNet)...

UKSRC

Global SRCNet partnership

Maximising UK Science delivery
Science support – UK;
RD&I – continuous development;
Community development, training etc



UK-based federated & distributed infrastructure & services (storage, compute)

UK SKAO community

- Future SKAO users
- Pathfinder users
- Precursors users

Deliver services for SKAO + existing / future Radio astronomy facilities

Science service (data storage, compute, science support) for UK radio astronomy and testbed for SRC development :

...e-MERLIN to LOFAR2.0, MeerKAT, HERA, ..etc. and SKAO....

UKSRC in a nutshell

The UKSRC is developing a facility and data-driven Research Infrastructure to:

- Support and enable the UK radio astronomy research by providing a new UK Digital Research Infrastructure, science support, and training ecosystem
- and
- Ensure the SRCNet* is delivered with the necessary capabilities and capacity to support SKAO science.

The UK pledges of the resources needed for the SRCNet globally (UK international pledge is ~15%). This includes (people, storage, compute, etc) that are pledged or seconded from the UKSRC facility.

*The SRCNet is the sole route to access SKAO science data. It is a critical part of the SKA delivery
Critical path to delivery of any SKAO science.

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SKA-scale data makes traditional download-and-analyse workflows impossible

The SRC Network functionality will be operationally crucial to SKA science outcomes.

It will provide the

- distribution of observatory data products (ODPs) to the SKA science users,
- the processing of SKA data products to create **advanced data products** (ADPs),
- the operation of a long-term science archive facility,
- and the user support needed for these activities.

It will be an interoperable **unified** SRCNet and not a set of loosely collaborating national SRCs that each support 'their' national users.

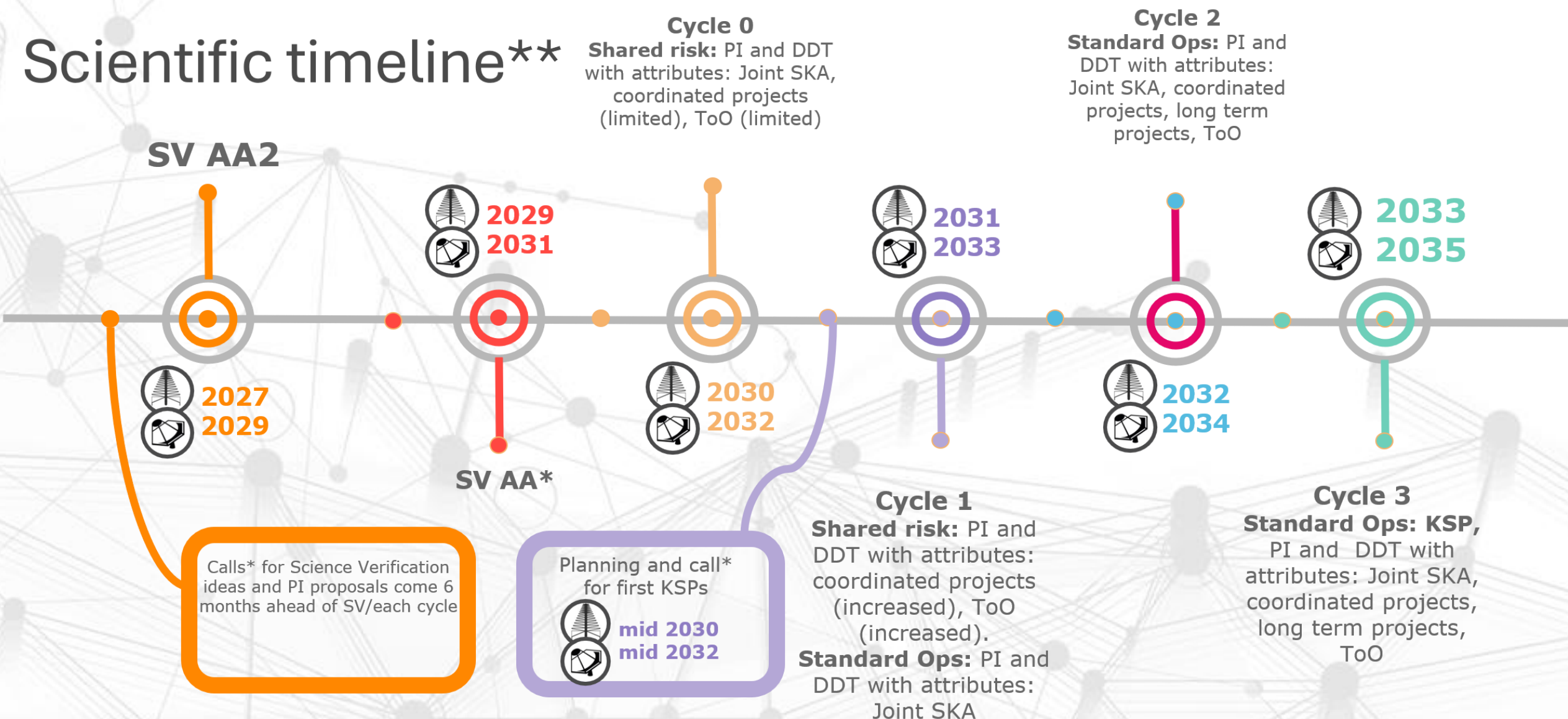
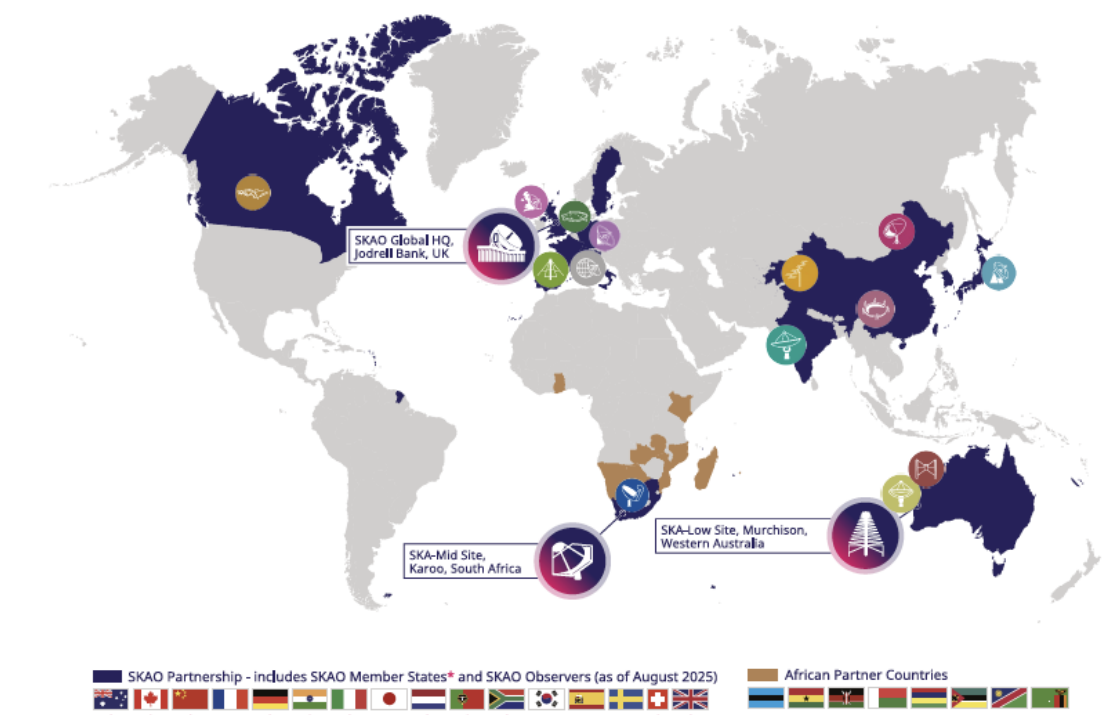
The total storage and compute requirement for SKA science drives the need for a SRCNet to provide the total resources delivered by the partner countries in proportion to their involvement.

... Users will not be downloading their SKA data. The SRCs will provide the resources and access for you to run your analysis and workflows.

... hence SRCs will be significant (distributed) DRI, storing large volumes of data, along with extensive metadata and provenance information...

Capability must be ready before science demand arrives

- **Build capabilities within SRCNet** before scaling out capacity
- **Co-develop** infrastructure and services using Pathfinder/Precursors data as testbed (**Virtuous circle of benefits – co-utilisation** of infrastructure and developments, real data, science and challenges, community growth)
- **SRC Delivery** aligned with SKAO telescope array construction (science from day 0)
- **SRCNet ready (capabilities)** for Science Verification (SV) end-to-end test of the science performance of SKA with the astronomical community.



Preparing the UK for SKA science

- **Stress test new ukSRC capabilities** using SKA Pathfinder and Precursor projects to ensure they are fit for service when SKAO data is available
- **Contributes to preparing the UK community** for early SKA science / science verification

UKSRC science support scheme

- The next phase of the demonstrator case scheme
- Dynamic allocation of resources for SKAO precursor/pathfinder projects
- 3-monthly onboarding cadence + fast-track sources
- Research software engineering support for software/workflow development
- One site → three sites

Starting Dec 2026

SKAO science verification support

- UKSRC dedicated support for UK astronomy exploitation of SKAO science verification data.
- Designed to give UK astronomers a headstart in SKAO science / KSP leadership & involvement

Starting Q4 2027

Tool development and services

- UKSRC has been developing tools for the exploitation of SKAO-related data and software (e.g., maltopuft, benchmarking, validation)
- The next phase of UKSRC should focus on translating tools into services for the astronomy community.

Starting now

ukSRC is at the intersection of multiple systems that ideally work as one



The international SRCNet federation



UK DRI ecosystem



STFC DRI Ecosystem



Astronomy and radio astronomy communities (UK and international)



National & International astronomy and radio astronomy facilities

Reducing friction and enabling collaboration between the systems is needed to maximise the science outputs and impact

Accreditation and interoperability enable continued access to SKA Data

Data access is only available via the internationally federated SRC Network.

ukSRC is an accredited SRCNet v0.1 node

The requirements will be revised for SRCNet v0.2 and beyond. They will evolve – this includes:

- Participation (FTE) expectations e.g. attending international planning in person, minimum contribution levels
- Processes and ways of working to operate as a collective SRCNet, including deployment and maintenance of the SRCNet software stack.
- Infrastructure being provided and supported (work that is not eligible to be pledged as SRCNet effort)
- Technical alignment
- Policy alignment

ukSRC needs to keep participating and contributing to the SRCNet development

ukSRC needs to respond to SRCNet changing requirements as requested e.g. SV and provide resources for development

Access to data is via a federated DRI

ukSRC cannot remove the SKAO data.

To make it feasible to access UK DRI resources, UK DRI needs to be interoperable with the SRCNet federation

ukSRC needs to provide long-term operations and enable long-term planning of services

Timing and timeframes

- Persistent services to UK and international users and (currently developers)
- Contribute to operational activities (FTE) that SRCNet requirements to remain an accredited node. It is not just infrastructure.
- Stability in resources and service provision is needed to deliver reliable and resilient services
- Provide persistent long-term archives

Pledging and Access

- Long term pledging over several years to meet international obligations to SRCNet and SKAO, and enable long term planning e.g. SV
- Services are provided on timelines that are defined by SKAO telescope operations
- Enable SKAO to allocate access and allocate compute time to international users.
- Enable UK users to have access to resources to provide additional support
- Benchmarking to understand what compute is required and how that evolves over time responding to changing science needs and technology developments over the multidecadal lifespan of the SKAO

Transitioning from development resources to an operational service

In 2022, the priority was development: understanding what the community needed and building the capabilities required for the UK SKA Regional Centre.

Over the last five years, the UK has:

- Reliably contributed expertise, infrastructure and leadership across SRCNet.
- Established key technical capabilities and operational experience.
- Developed tools and services that have the potential to provide a competitive advantage for UK researchers.
- Built trust and credibility with international partners through sustained, reliable delivery.

By 2028, however, the challenge shifts from building capabilities to operating services.

ukSRC must operate as a resilient, focused and reliable facility, supporting:

- SRCNet and SKAO Science Verification and beyond
- Increased provision of services to the widest UK research community
- Contribution to the LOFAR 2.0 Long-Term Archive
- Delivery of the UK's international commitments

The shift is from developing capabilities, through operational transition, to delivering a reliable national facility for UK researchers and international partners.

SKA researchers need a service, not just access to compute and storage

Access

Data, compute and storage

Learn

Training and workflow development

Analyse and Advice

Scientific and technical support

Optimisation

Workflow profiling and benchmarking

Community & Collaborations

Building teams and science cases for Science Verification and future Key Science Projects.

The challenge is using infrastructure effectively to enable world leading science.

What SKA Science Needs:

- **National infrastructure that supports multi-year resource planning**
So ukSRC can make credible multi-year pledges of infrastructure & FTE aligned with SRCNet and telescope requests.
- **Persistent services**
Covering storage, compute, identity, networking, domain expertise/user support and the people required to operate them. Timelines regarding resource requests are driven by the SKAO telescope operations and/or SRCNet. This is unlikely to align with UKRI research allocation calls for short term projects.
- **SRCNet accredited node to be able to deliver SKA data**
Meet requirements to remain an accredited node as SKAO and SRCNet matures
- **Interoperability enabling federation-ready access**
So appropriately authorised UK and international researchers can use UK resources allocated by SRCNet/SKAO. It will not be possible to download the SKAO data and then use compute facility that is not part of the federation (e.g. current stand alone NCRs).
- **Planning for evolving requirements and SKAO operations over multiple decades**
Including benchmarking, workflow profiling and agreed review points rather than fixed assumptions. Enables researchers to access heterogenous compute across international SRCNet nodes.
- **Specialist expertise**
So researchers can access domain specific and digital technical professional expertise to develop technical aspects of their proposals and analysis efficiently. Support adapting workflows to the scale of SKA data.

Acknowledgments



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