From AENEAS to the SKA Regional Centres. Spanish contribution

Susana Sánchez Expósito, Lourdes Verdes-Montenegro, Julian Garrido
Instituto de Astrofísica de Andalucía – CSIC
AMIGA group. http://amiga.iaa.es

12 October 2018. IBERGRID. Lisbon

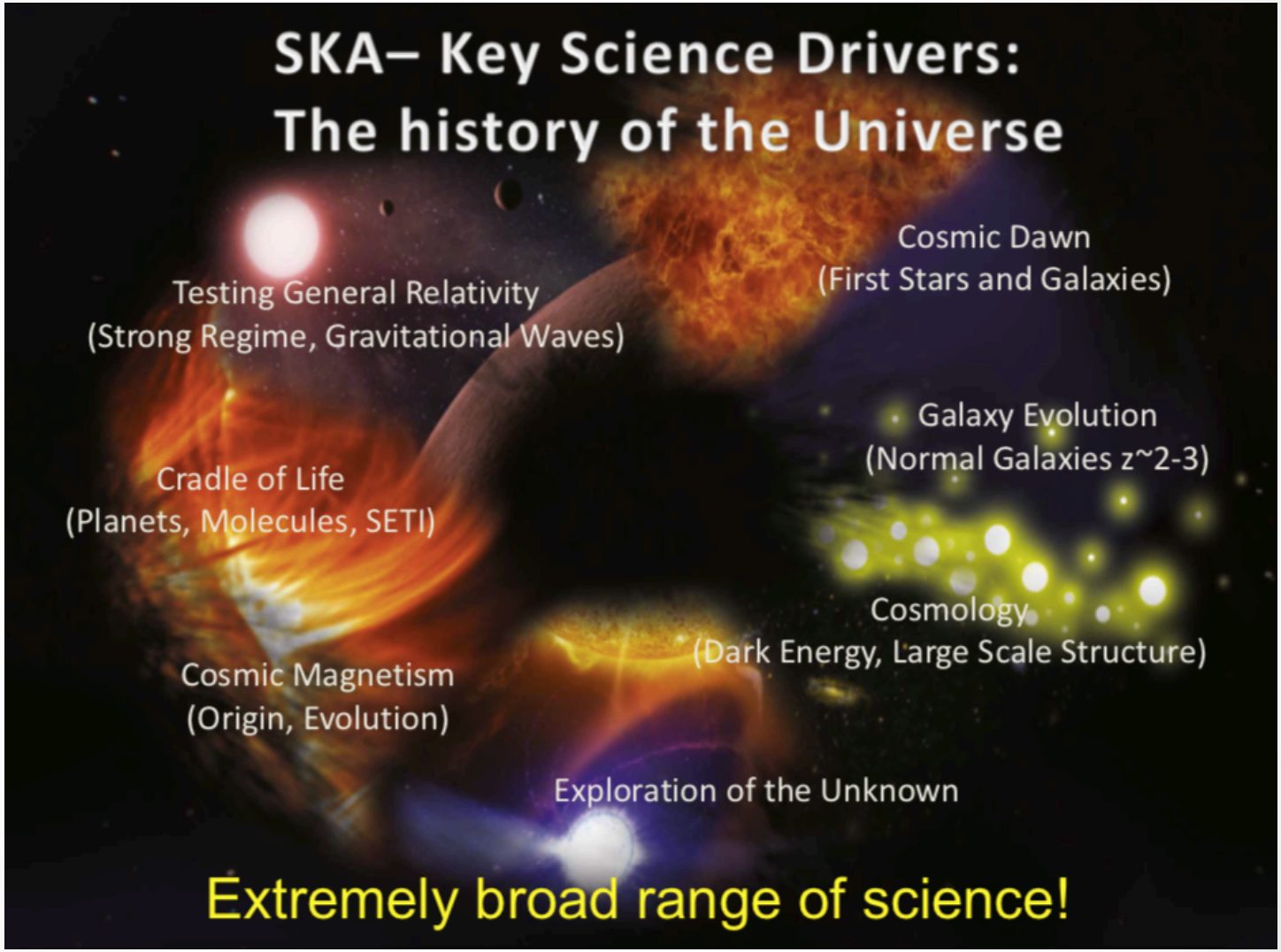
Outline

- The Square Kilometre Array (SKA)
- The SKA Regional Centres (SRCs)
- SKA in Spain
- Activities related to SRCs in Spain

SKA and the SKA Regional Centres

The science driving the SKA

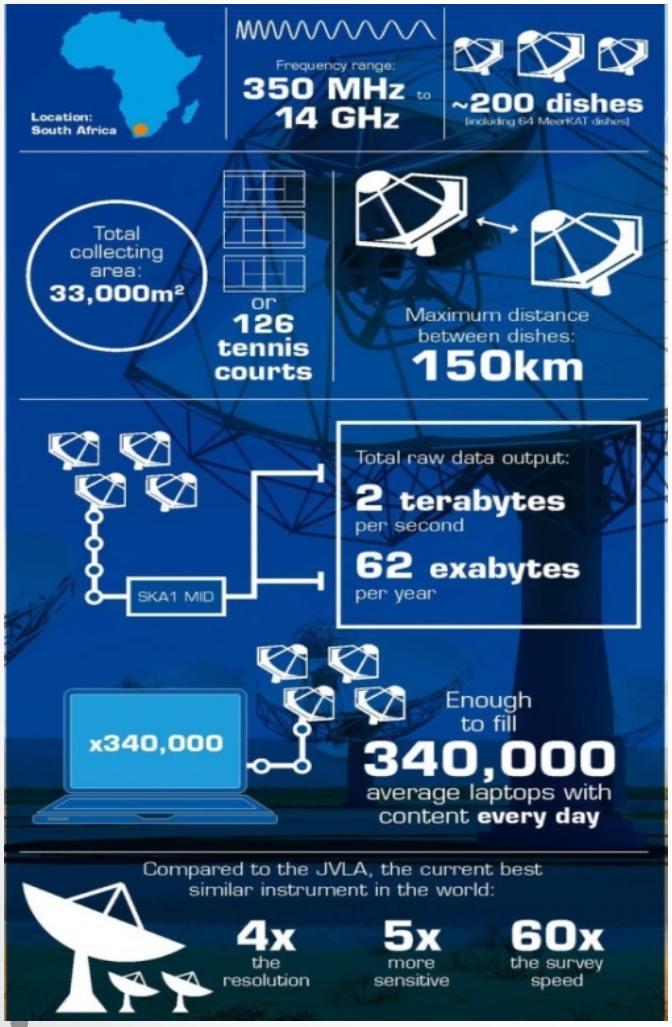
Open key questions in Astrophysics, Astrobiology and Fundamental Physics



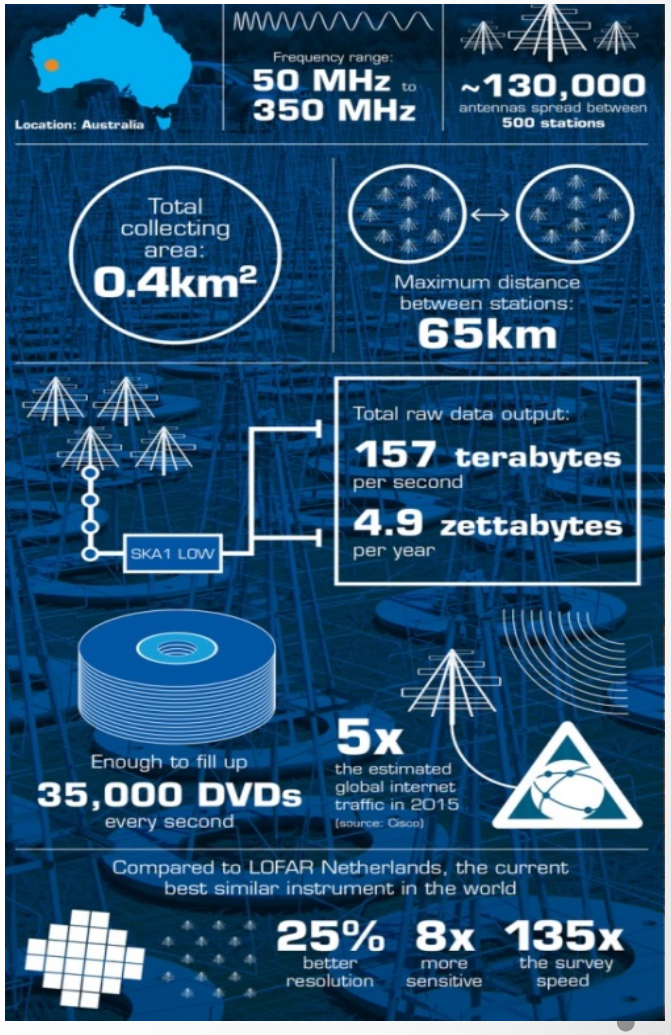
R. Braun, SKA Science Director. April 2018

How to answer these questions (from the point of view of **the instrument**) ?

SKA1 MID



SKA1 LOW



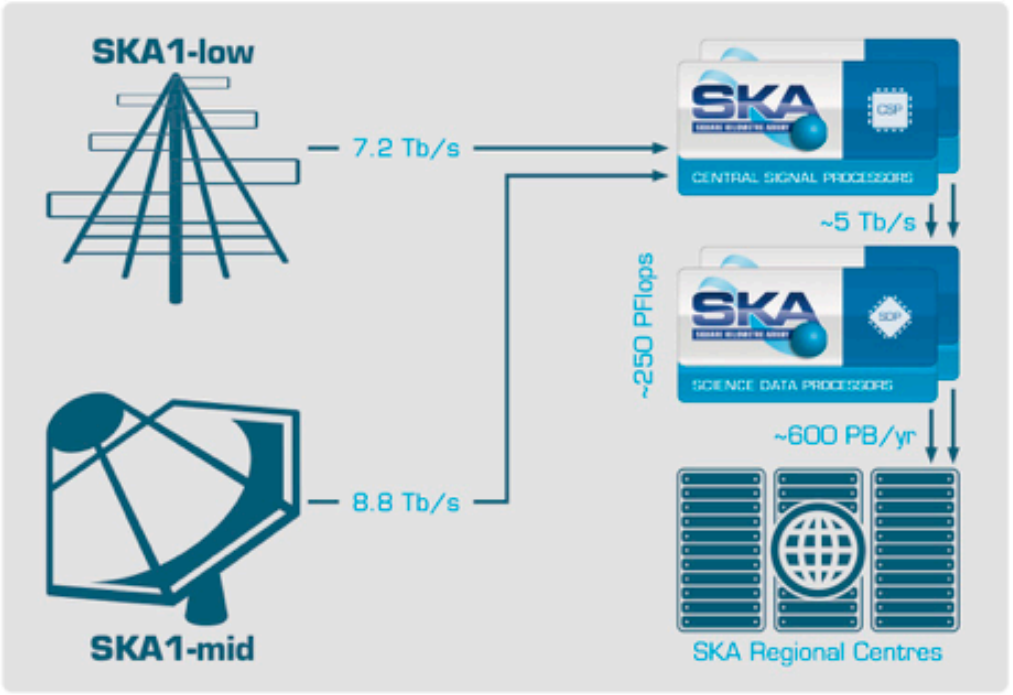
Credits: Ska organization

How to answer these questions (from the point of view of the **computing resources**)?

The data journey

Basic data products will be produced and stored in Cape Town for SKA1-mid and Perth for SKA1-low. From there, they will be delivered to a global alliance of SKA Regional Centres for further processing and archiving and access by the user community.

New data models will need to be developed as current software packages for radio astronomy data reduction don't have the capabilities to handle the SKA's large bandwidths and Field of View datasets.



The SKA will be:

Distributed
One observatory operating two telescopes on three continents for a global scientific community.

Accessible
Common software and user interface. Pre-programmed algorithms. Training at the SKA Regional Centres.

Open
Open Access to non-proprietary data.

1010
0100
0110

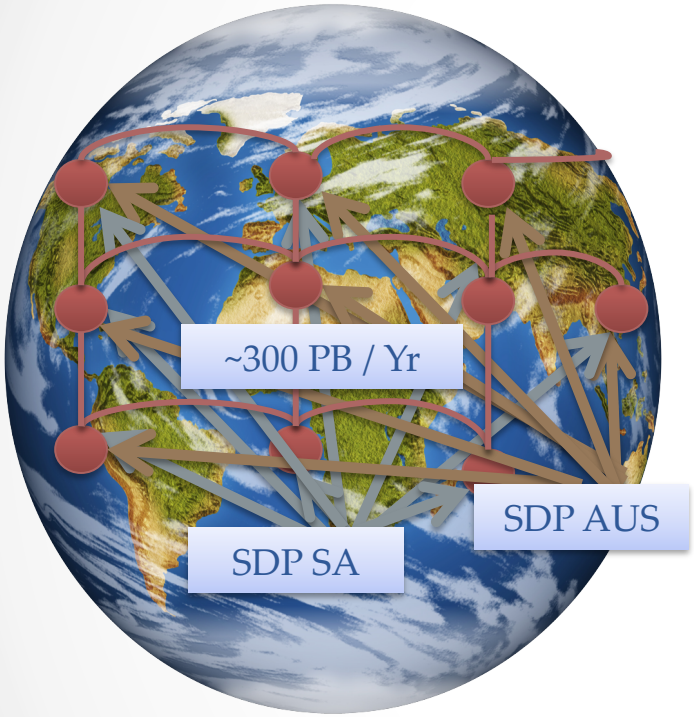
Citizen-ready
Access to SKA public data for citizen science projects.

@ska_telescope @SKA_telescope Square Kilometre Array YouTube The Square Kilometre Array

1.2 August 2018

SKA Fact sheets. August 2018. skatelescope.org

SKA Regional Centres



A collaborative network of SRCs [1]

- Data Products delivered by the SDP are not in the final state for science analyses
- Data volumes are so large that direct delivery of product to end users is unfeasible
- The community of scientists working on SKA data will be geographically distributed

SRCs will provide access not only to the SKA data but also to the analysis tools and processing power.

Key role in the exploitation of SKA data and the achievement of the SKA scientific goals.

[1]SKA Regional Centres: Background and Framework. SKA-TEL-SKO-0000706. SRC Committee group. 2017

SKA Regional Centres

International initiatives developing SRCs

SKA in Spain

SKA in Spain

Coordination of the Spanish Participation in the SKA

VIA-SKA: Feasibility study of the Spanish participation in the SKA

PI: L. Verdes-Montenegro (IAA-CSIC).
Participants: CAB (INTA-CSIC), IFCA (CSIC), DICOM/UCAN, ICE-CSIC, IAC, OAN (IGN), Univ. Barcelona, Valencia, Pol. Cartagena, Granada, UCIII

- Diffusion and organisation of SKA activities in coordination with SKACON
  - Support to organization of meetings and conferences
  - Conferences in research centers
  - Outreach: talks, Spanish SKA Web, media, etc
- Support to academic groups, industry and MINECO
  - Interaction with design consortia, SKA Office
  - Diffusion of funding calls and coordination of proposals
  - Support to the incorporation in SKA committees/SWGs/KSP/design WPs
- Industry capacity map, preparation for procurement (collab. with CDTI)
- Joint discussions with international SKA related stakeholders

2008

Preparatory phase

2013

Detailed design, preconstruction

2020

SKA1 construction

RIA
RED DE INFRAESTRUCTURAS DE ASTRONOMIA

SKA in Spain

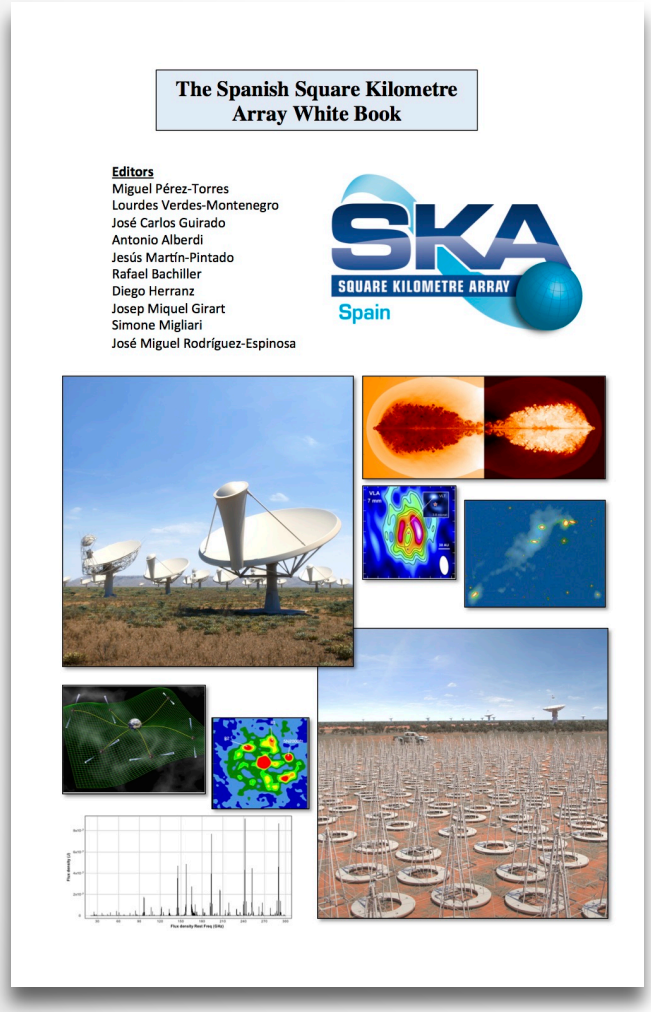
VIA-SKA

Coordination of the Spanish Participation in the SKA

12 Spanish research centres and 12 companies participate in 8 SKA Pre-construction Consortia

SKA in Spain

Science



Publication in 2015 of the Spanish SKA White Book (120 researchers from 40 centres)
http://spain.skatelescope.org/ska-science/libro-blanco-ska/

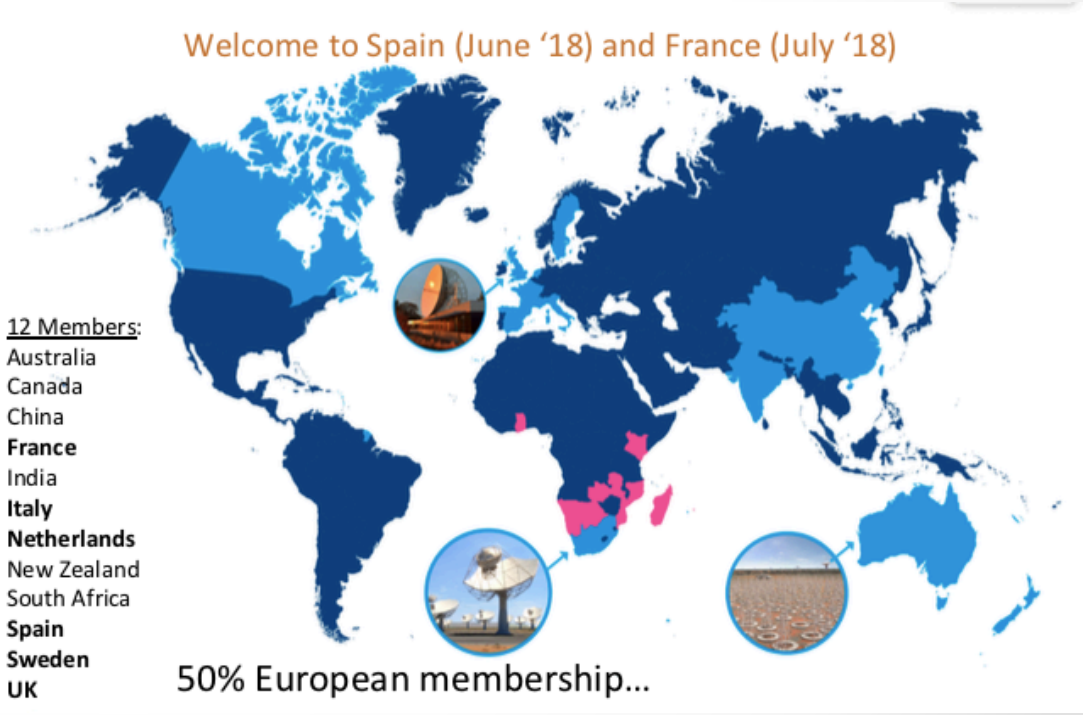
Contribution to > 14 chapters of the SKA Science Book "Advancing Astrophysics with the SKA" (2015)

28 researchers of 11 Spanish institutions participate in 9 out of the 11 SKA Science Working Groups/ 2 Focus groups

SKA in Spain

Coordination of the Spanish Participation in the SKA

Since 1st June Spain is the 11th Member country of the SKA Organization



SKA
SQUARE KILOMETRE ARRAY
Spain

Activities related with SRCs in Spain

Calibration of LOFAR ELAIS-N1 data in the Amazon Cloud

http://amiga.iaa.es/p/352-LOFAR-Astrocompute.htm
http://www.lofarcloud.uk/

Granted in an AWS & SKAO call

PI: J. Sabater (U. Edinburgh)

- *How to adapt a LOFAR pipeline to AWS*
- *Would be feasible to process all LOFAR survey Fields data on AWS?*

We also tested other infrastructures:

- Clusters (at IAA-CSIC and Rutherford Appleton Laboratory)
- Grid (IBERGRID)
- Cloud:
  - an academic private multi-site cloud system, the EGI Federated Cloud
  - an academic private one-site cloud (RAL)

Calibration of LOFAR data on the cloud J. Sabater, S. Sanchez-Exposito, P. Best, J. Garrido, L. Verdes-Montenegro, D. Lezzi 2017 Astronomy and Computing, 19 75-89. DOI: https://doi.org/10.1016/j.ascom.2017.04.001

EGI Federated Cloud for calibrating and analysing Radio-Astronomy data (Poster)
http://amiga.iaa.es/FCKeditor/UserFiles/File/radio_fedcloud.pdf

SKA-Link: combining knowledge to pioneer Big-Data solutions for SKA Data Centres

http://amiga.iaa.es/p/330-SKA-Link.htm

2-year project funded by CSIC

PI: L. Verdes-Montenegro (IAA-CSIC)

*Create a set of **best practices** that assist the SKA community to successfully exploit SKA data, with an emphasis on the use of technologies that facilitate the **reproducibility***

Areas of work

- Facilitate the reproducibility of the scientific methods and their verification, then their reuse and repurpose
- Identification of barriers and ways to overcome them
- Inventory of technologies/ technical strategies
- Incentives/Metrics

AMIGA

Member of SKA & e-Science communities

SKA community members

Experts on e-Science technologies

Participation in the SRCCG

SKAO Members
- Antonio Chrysostomou - Chair
- Rosie Bolton - SRC Project Scientist
- Miles Deegan
- Nick Rees

Member Representatives
- Séverin Gaudet - Canada
- Jeremy Main - South Africa
- Peter Quinn - Australia
- Yogesh Wadadekar - India
- Michael Wise - Europe
- Shenghua Yu – China

External Advisory Members
- Ian Bird - CERN
- Andy Connolly - LSST
- **Lourdes Verdes-Montenegro – IAA-CSIC**

Mission
SRCCG is tasked with defining the principles, policies, requirements and MoUs for a collaborative network of SRCs

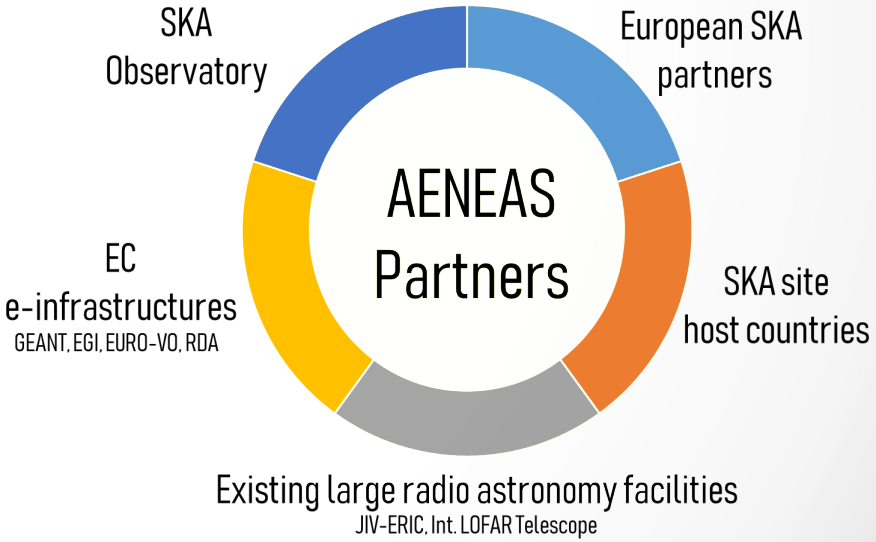
(*) SKA-link deliverables will be integrated into SRCCG milestones

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

http://www.aeneas2020.eu

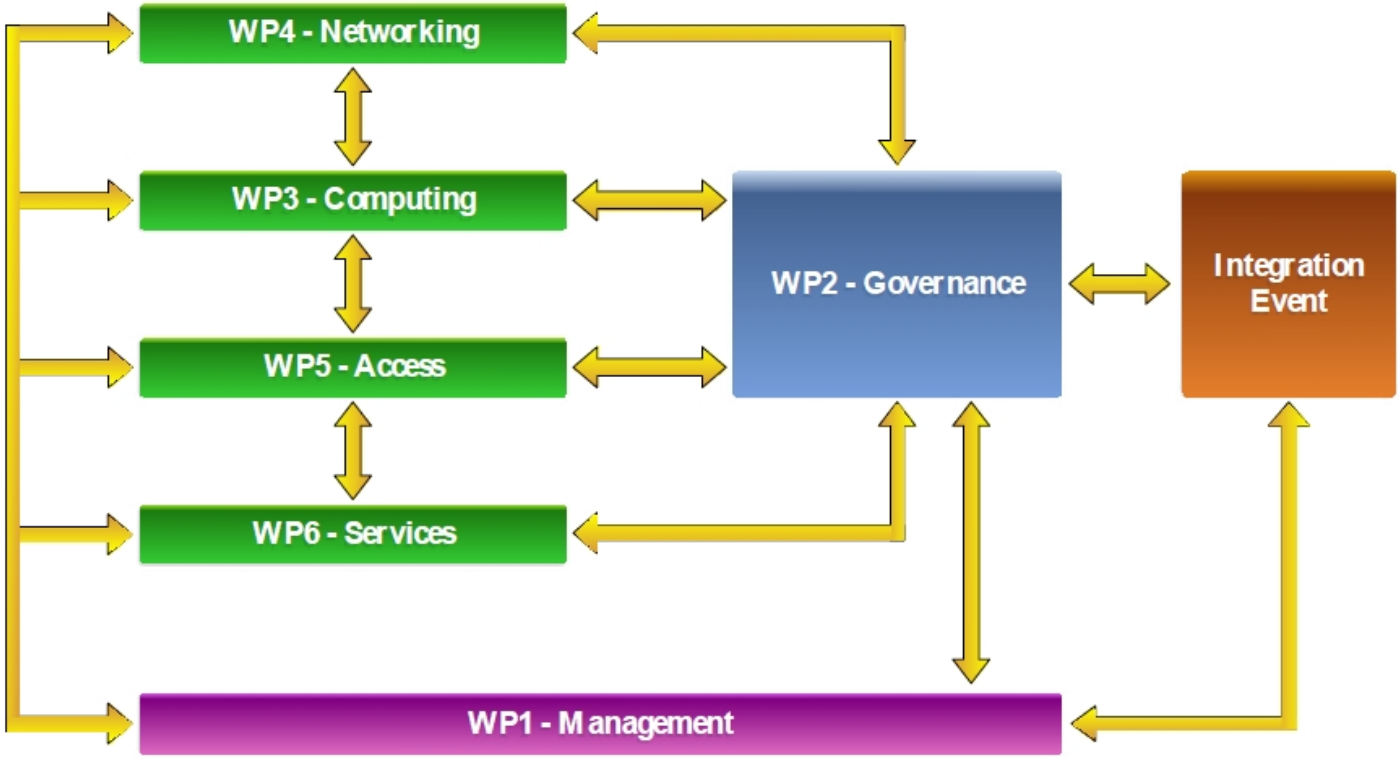
Developing a science-driven, functional design for a distributed, federated European Science Data Centre (ESDC)

- H2020 Work Programme (731016)
- 3-years project
- Started 1/01/2017
- Coordinator: M. Wise - ASTRON (NL)
- 28 partners



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

Developing a plan for the implementation of a European Science Data Centre (ESDC) for the SKA



WP1

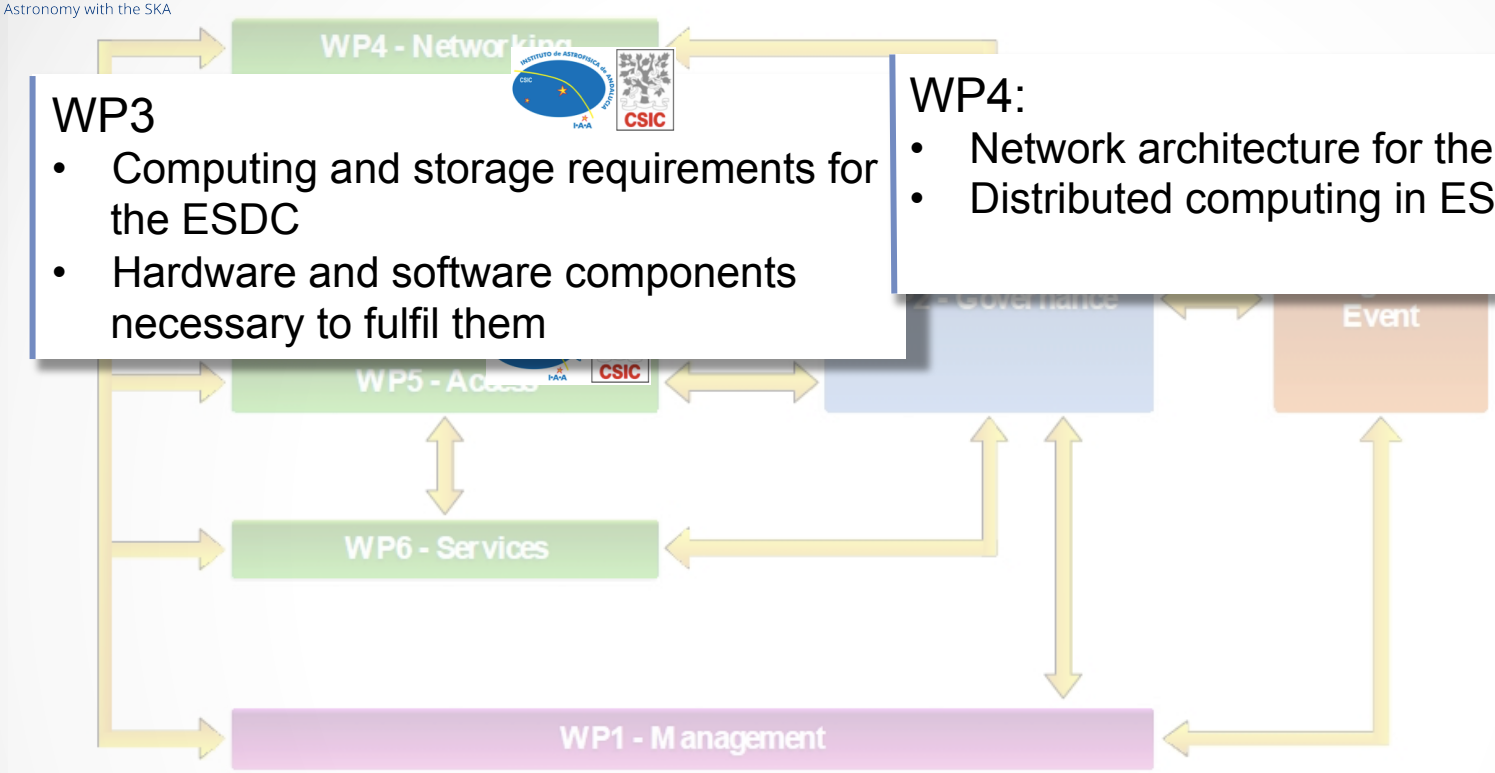
- Project management
- Internal communication & with community
- Dissemination

WP2:

- Integrate results from WP3-6 into the final study
- Cover non-technical aspects: policy, funding, governance, industrial engagement

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

Developing a plan for the implementation of a European Science Data Centre (ESDC) for the SKA



WP3

- Computing and storage requirements for the ESDC
- Hardware and software components necessary to fulfil them

WP4:

- Network architecture for the ESDC
- Distributed computing in ESDC

WP5

- Interface between the ESDC and the community
- User interaction models

WP6:

- Interoperability among e-Infrastructures that are of interest for SKA
- Federation within ESDC and across multiple SRCs

ESCAPE

European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures

European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

- H2020 “Implementing the EOSC”
- Start: 2019 (42 months)
- Coordinator: CNRS (FR)
- 32 partners

Addressing the Open Science challenges shared by ESFRI facilities and other pan-European research infrastructures in Astronomy and Particle Physics

IAA-CSIC participates:

- on behalf of the SKA ESFRI together with SKAO, ASTRON, INAF and SURFsara
- in WP5, focused on defining and implementing a flexible Science Platform for the analysis of open access data available through the EOSC environment.
- Evaluating the level of reproducibility and achievement of the FAIR principles supported by the platform

EXCELENCIA SEVERO OCHOA

Centre of Excellence “Severo Ochoa” distinction

- An accreditation from the Spanish Ministry of Science that acknowledges the Spanish centers that carry out cutting-edge research and demonstrate scientific leadership and impact at global level
- A renewable 4-years grant
- A **prototype of SKA Regional Centre fully engaged with Open Science, included** in the Severo Ochoa scientific programme presented by IAA-CSIC

Thanks

http://amiga.iaa.es

sse@iaa.es