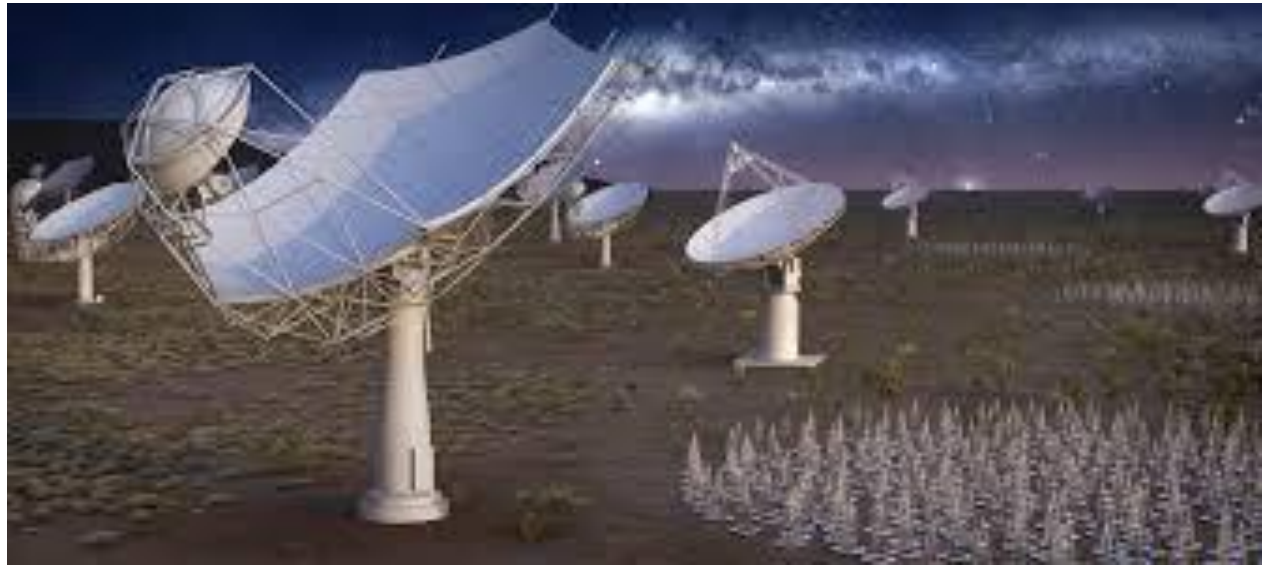
PT activities:

From Orchestration of Cloud Services with Critical Components in SKA to a PT SRC



Team Membres:

Dzianis Bartashevich
Domingos Barbosa
João Paulo Barraca
Miguel Bergano
Bruno Morgado
Bruno Coelho
Helder Ribeiro
Dalmiro Maia

- 2012. ENGAGE SKA -> develops PPP
- 2015 ENGAGE SKA selected for national Roadmap
  - The only Astronomy RI at the National Roadmap
- 2017 ENGAGE SKA awarded 3.8M€ (2017-2021)
  - Radiastronomy training
  - RNCA compute node -> Tier 2
  - Engage industry in Pre-construction
  - Strong DevOPS culture
  - Aligned with national/regional roadmaps
- 2019- PT SKA White Book
  - Mapping SKA Book contributions
  - Science updates / Industry update
  - Growing Participation
    - The biggest participation in SWGs of current astronomy projects.

2019; PT – Founding Signatory Member of IGO

Radioastronomy and space science

Political Frameworks:

- AIR Centre - a new Atlantic Initiative
- Portugal SPACE –new national space agency; HQ in Azores
- SKA – Full Membre Observatory, March 2019 (*)

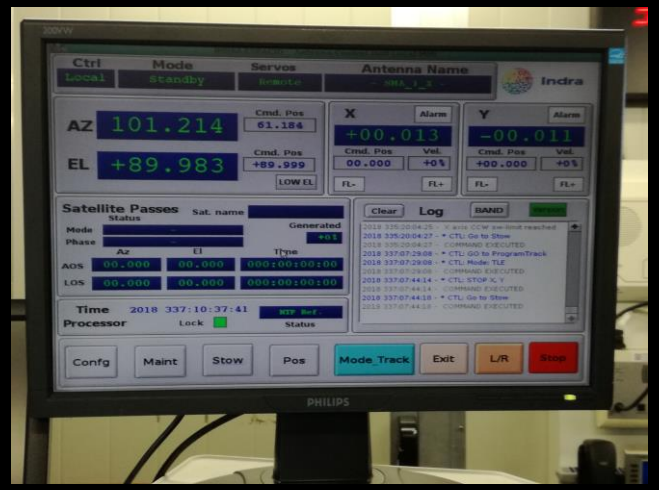
Infrastructures

- RAEGE (VLBI radiotelescopes, space geodesy)
- Pampilhosa – ENGAGE
- SSA-SOLAR – ENGAGE
- FCT 15m tracking (Proba-3 and EO sats)
- Azores SATCOM /VLBI*

Cooperation

- AERAP - AFR-EU Radioastronomy Plaform (2011-)
- DOPPLER - FCT-AKDN Cooperation PT-MOZ (2018-2021+)
- HOU - light HI telescopes
- (AIR centre – Atlantic cooperation and beyond)

Azores VLBI: RAEGE VLBI 2010 Radiotelescope



- Geodetic VLBI in expansion
- Significant increase in radioastronomial capabilities, techniques & applications

Enhancing Azores VLBI cluster (and single dish science world class)
Great potential for EVN/AVN “integration” – PT/Azores/AIR synergies

PT Bridiging contribution to the project

- Agile teams (System, Buttons,…)
- SKA's System Team is presently comprised of 6 DEVs +1 SM + PO
- Its roles consists on creating and maintaining the infrastructure on top of which the different SKA software products will run as well as building, configuring and providing the tools needed for the collaboration between the different teams that compose the SKA Observatory.
- Our main focus : implementing an automated pipeline capable of testing, extracting metrics and building software products from source code with the least possible human intervention.

PT Bridiging contribution to the project

- Currently core to the SKA System Team which is a specialized Agile Team that assists in building and using the Agile development environment, including Continuous Integration, test automation, and Continuous Deployment.
- The System Team supports the integration of assets from our Agile teams, performs end-to-end solution testing when necessary, and assists with deployment and release.
- ENGAGE SKA -> Cloud platform for SKA CI/CL; repositories for testing.

- Link: https://github.com/orgs/ska-telescope/teams/skare

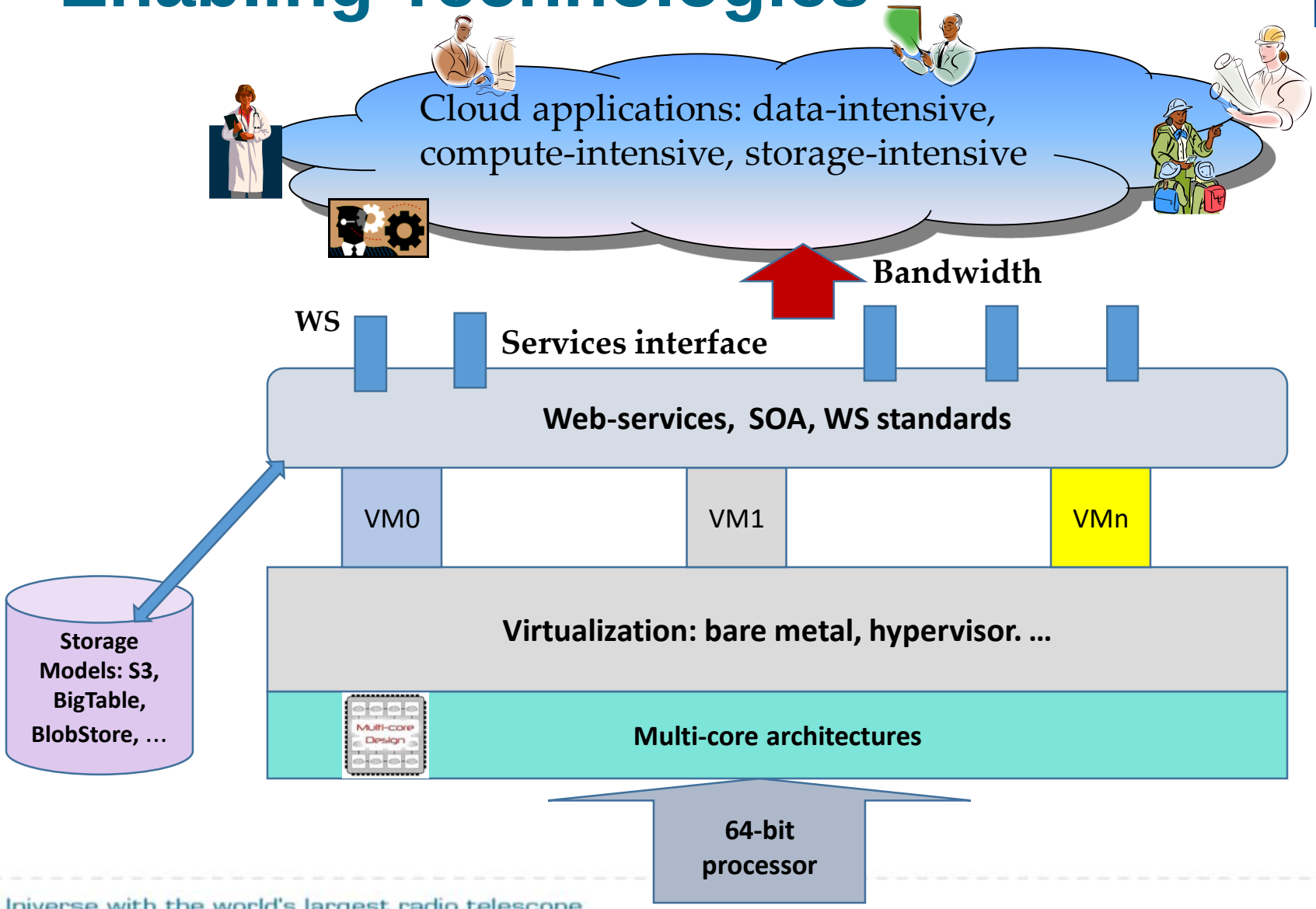
SKA SW Priorities and Principals:

- ❑ Scalable
- ❑ Affordable
- ❑ Maintainable
- ❑ Support current state-of-the art algorithms
  - ✓ Imaging techniques and data visualization
  - ✓ Machine learning and Artificial Intelligence
  - ✓ Data Mining

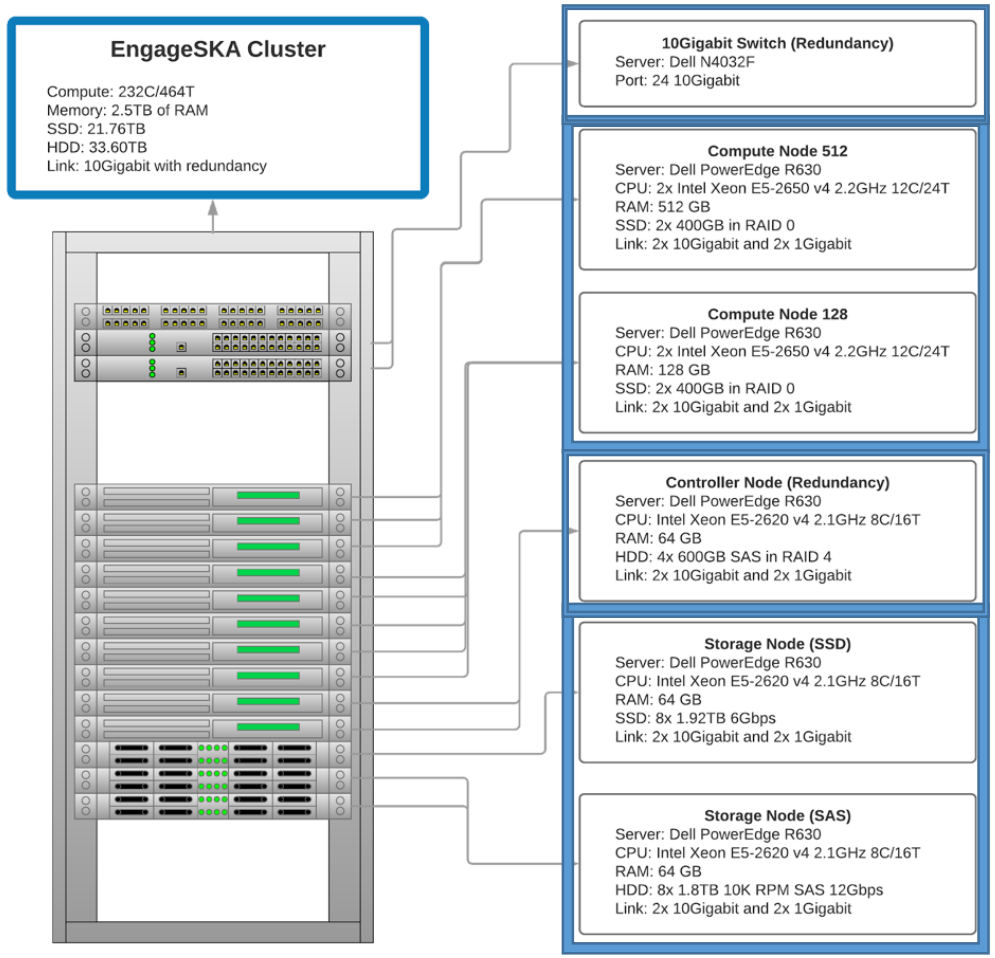
Secondaries:

- ❑ Automation
- ❑ Backup and recovery
- ❑ Security
- ❑ Maximum uptime
- ❑ Fast resource deployment
- ❑ Handle a huge amount of data
- ❑ Efficient resource utilization

Enabling Technologies



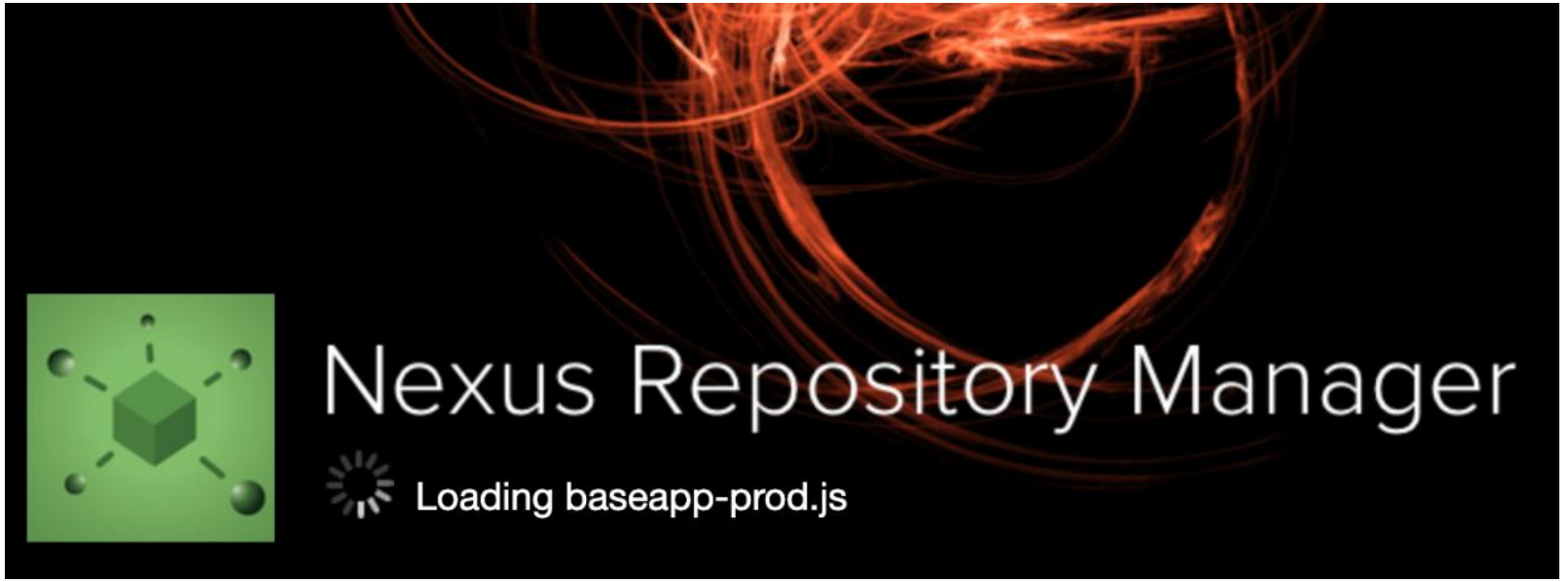
Prototype of Cloud Infrastructure Aligned with ALASKA – SDP SYSTEM



Agile Scrum

Nexus Repository OSS

- Currently hosting docker images and python releases



Link: https://nexus.engageska-portugal.pt

Current ENGAGE OpenStack Usage

Platform & High-Availability

VCPU Usage

Used 320 of 384

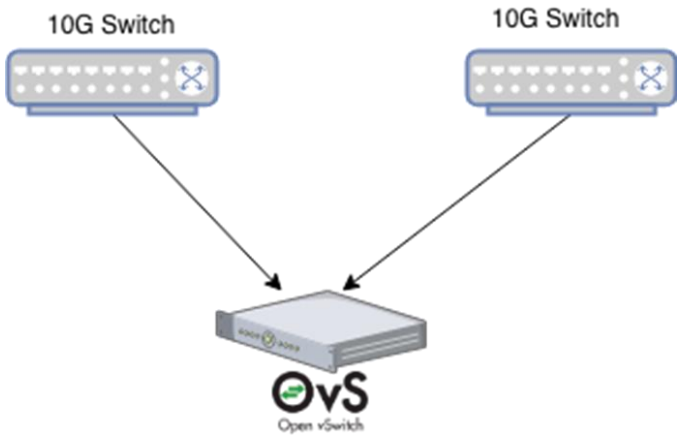
Memory Usage

Used 1.8TB of 2.1TB

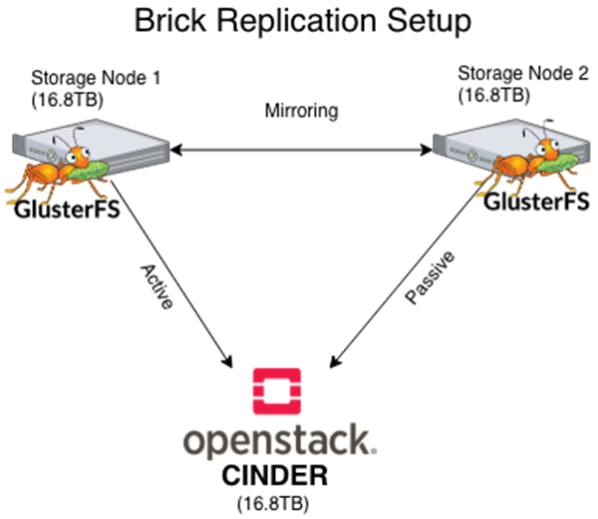
Local Disk Usage

Used 220GB of 3.4TB

Server node redundancy



Controller node redundancy

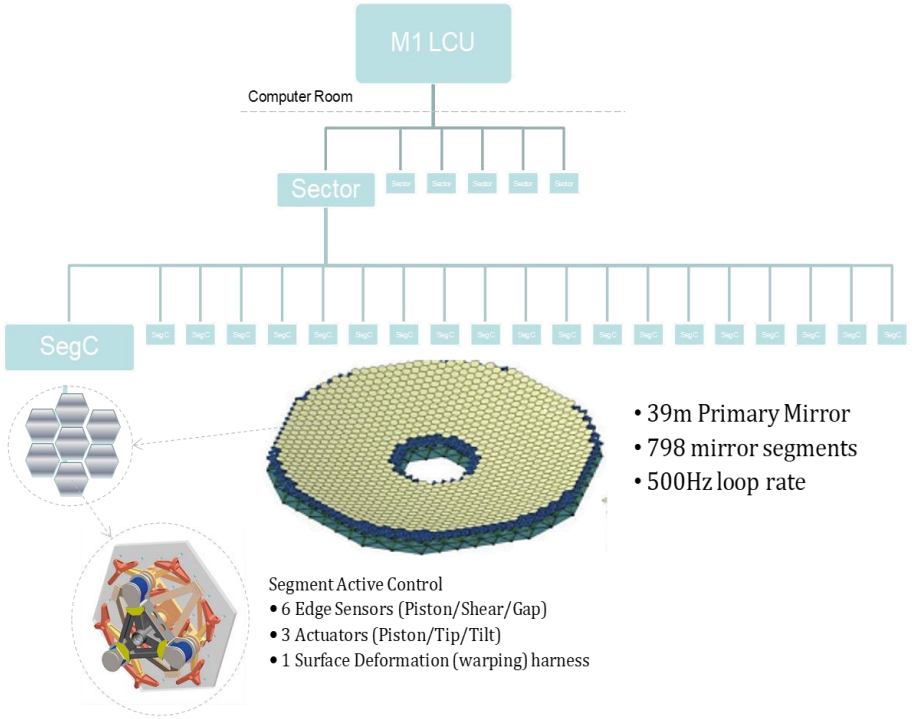


OpenStack Monasca & Grafana

Spin-off: validation ELT M1 Actuators LCS stress tests

An HTC problem

ENGAGE SKA / Critical Software / ESO



- Verify the feasibility of the E-ELT M1 LCS design.
- 500 Hz M1 figure loop rate.
- Measurement data (ES and PACT) from each of the 798 segment subunits arrive separately at loop rate.
- Communication via UDP multicast/unicast on switched ethernet, 10Gbps bandwidth at the control room and multi core processing architecture.

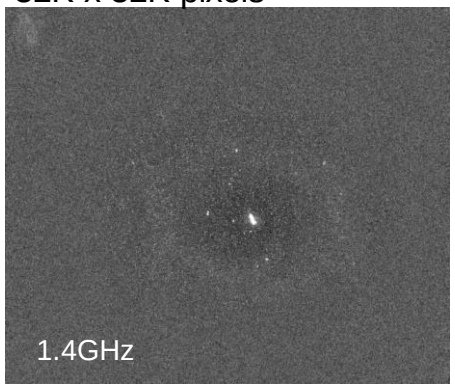
Cyber-infrastructure

SKA Science Data Challenge #1

ENGAGE SKA Portugal

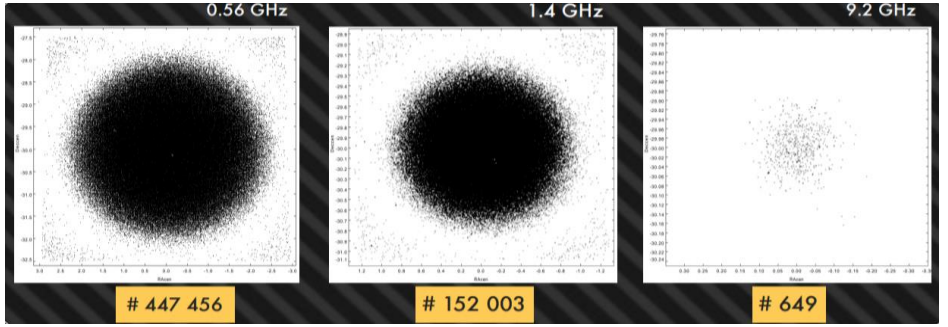
Bruno Coelho (IT); Domingo Barbosa (IT); Sonia Antón (CIDMA, Dep Física-UA); Jorge B. Morgado (FCUP); Valério Ribeiro (CIDMA, Dep Física-UA, IT); Dzianis Bartashevich (IT); João Paulo Barraca (IT); Miguel Bergano (IT); Dalmiro Maia (FCUP)

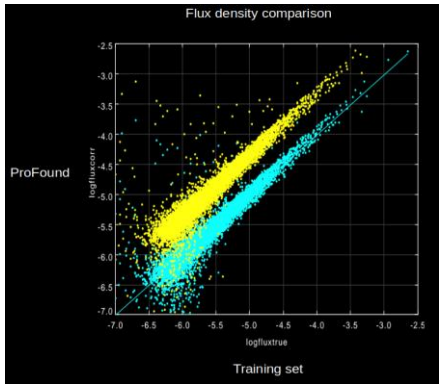
3 images
560MHz, 1.4GHz, 9.2 GHz
32K x 32K pixels



ProFound
(Rabotham+2018)

Source Finding





Fluxes

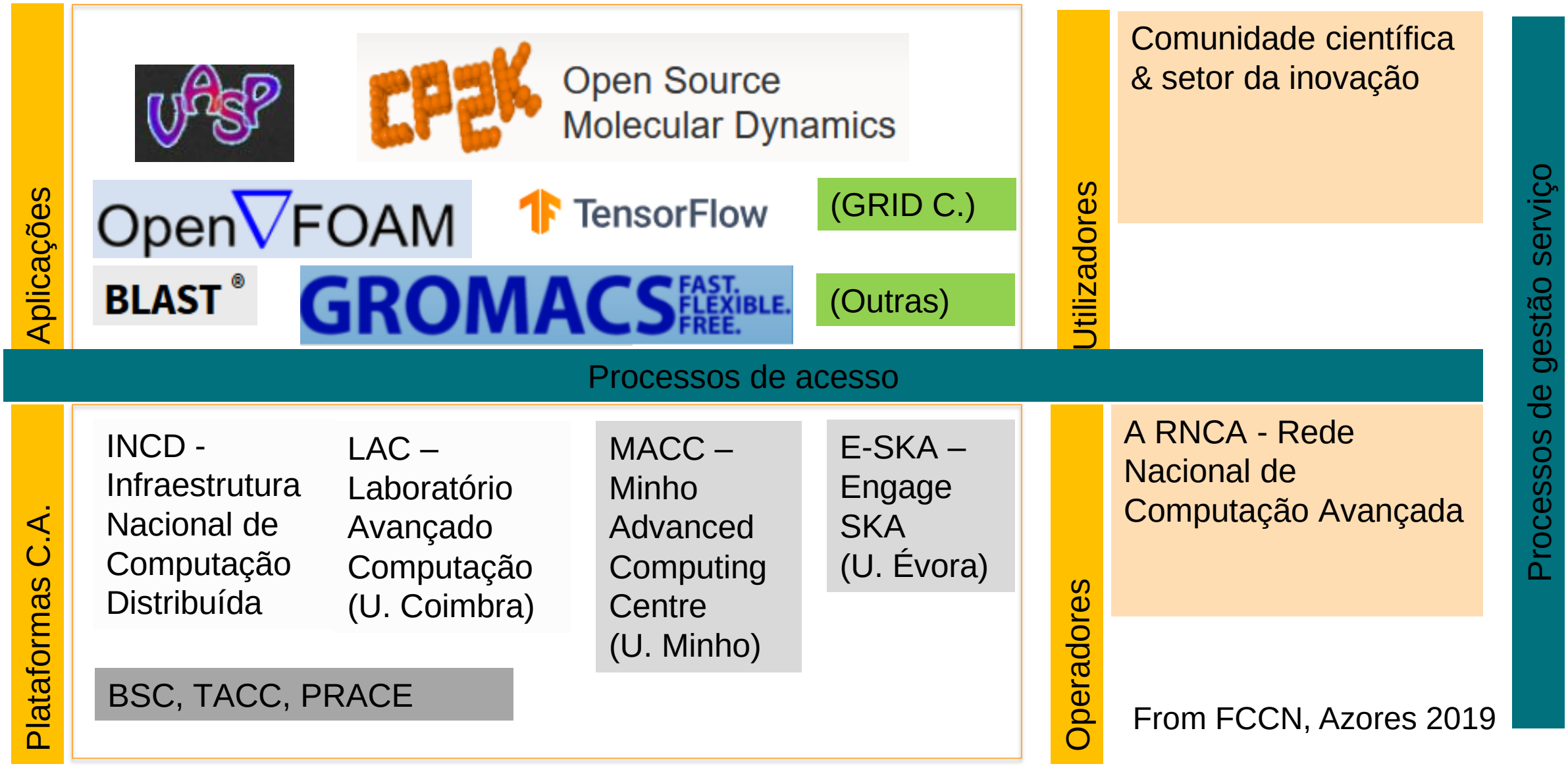
Classification
(SS-AGNs, FS-AGNs, SFGs)

Rede Nacional de Computação Avançada

- Nov-2017 - FCT, UMinho e UTAustin assinam protocolo para a criação do Minho Advanced Computing Centre
- Jan-2018 - protocolo de colaboração entre o Centro de Supercomputação de Barcelona (BSC) e o Centro de Computação Avançada do Minho (MACC)
- RCM 26/2018 (Março) – "Desenvolvimento de uma rede nacional de computação avançada, no âmbito do Eixo 5." PORTUGAL INCoDe.2030
- Despacho n.º 4157/2019 (Abril) – enquadra a RNCA no âmbito do roteiro nacional de infraestruturas para investigação

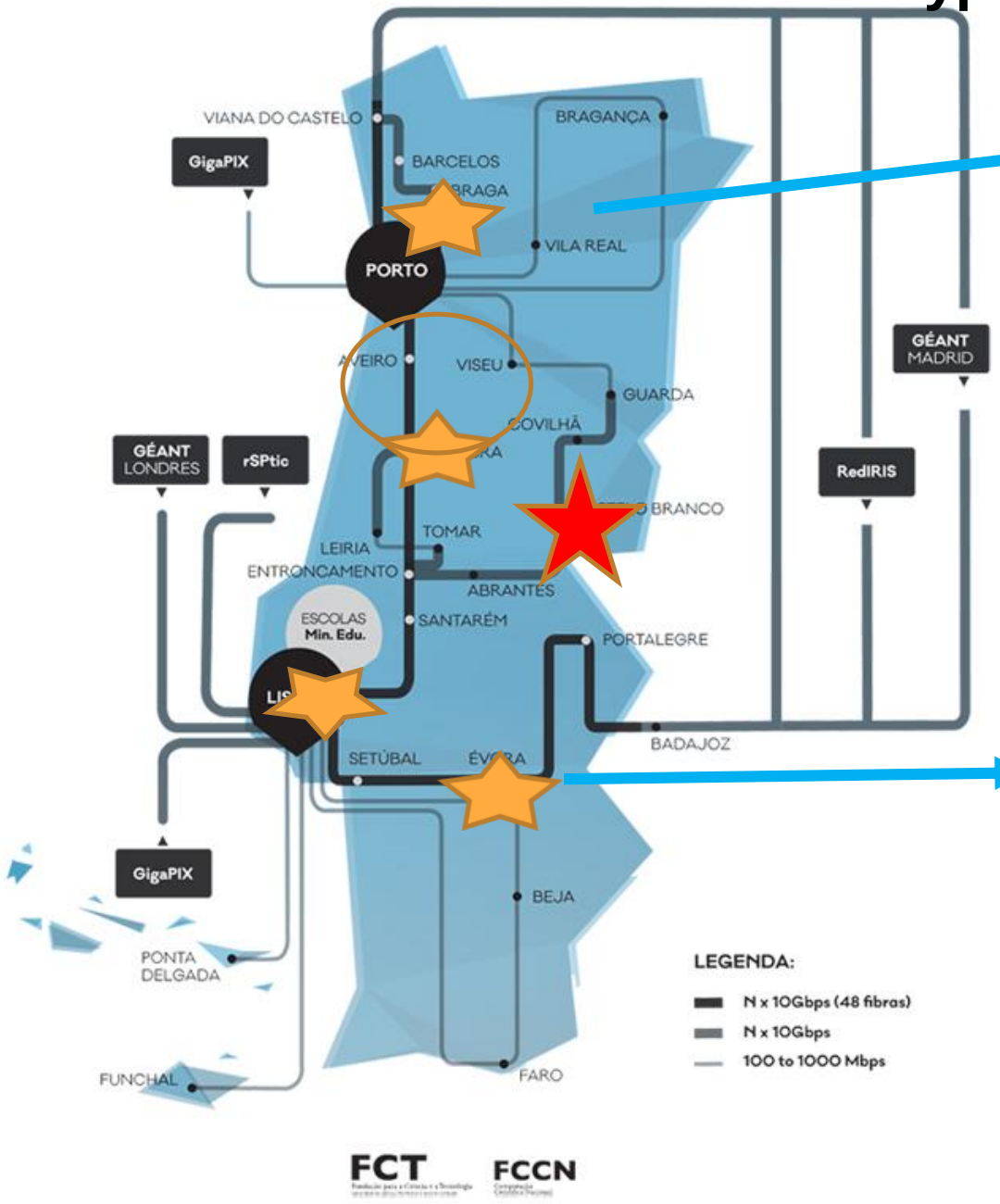
From FCCN, Azores 2019

A computação avançada no contexto da RNCA



From FCCN, Azores 2019

Prototyping: factoring in RNCA developments
Towards EOSC@PT



BOB+ Euro-HPC - 10PFlop system

Oblivion@ENGAGE SKA ~1M€ -> 11000 cores; 300TFlops; 1PB storage; 50% CPU time

RNCA

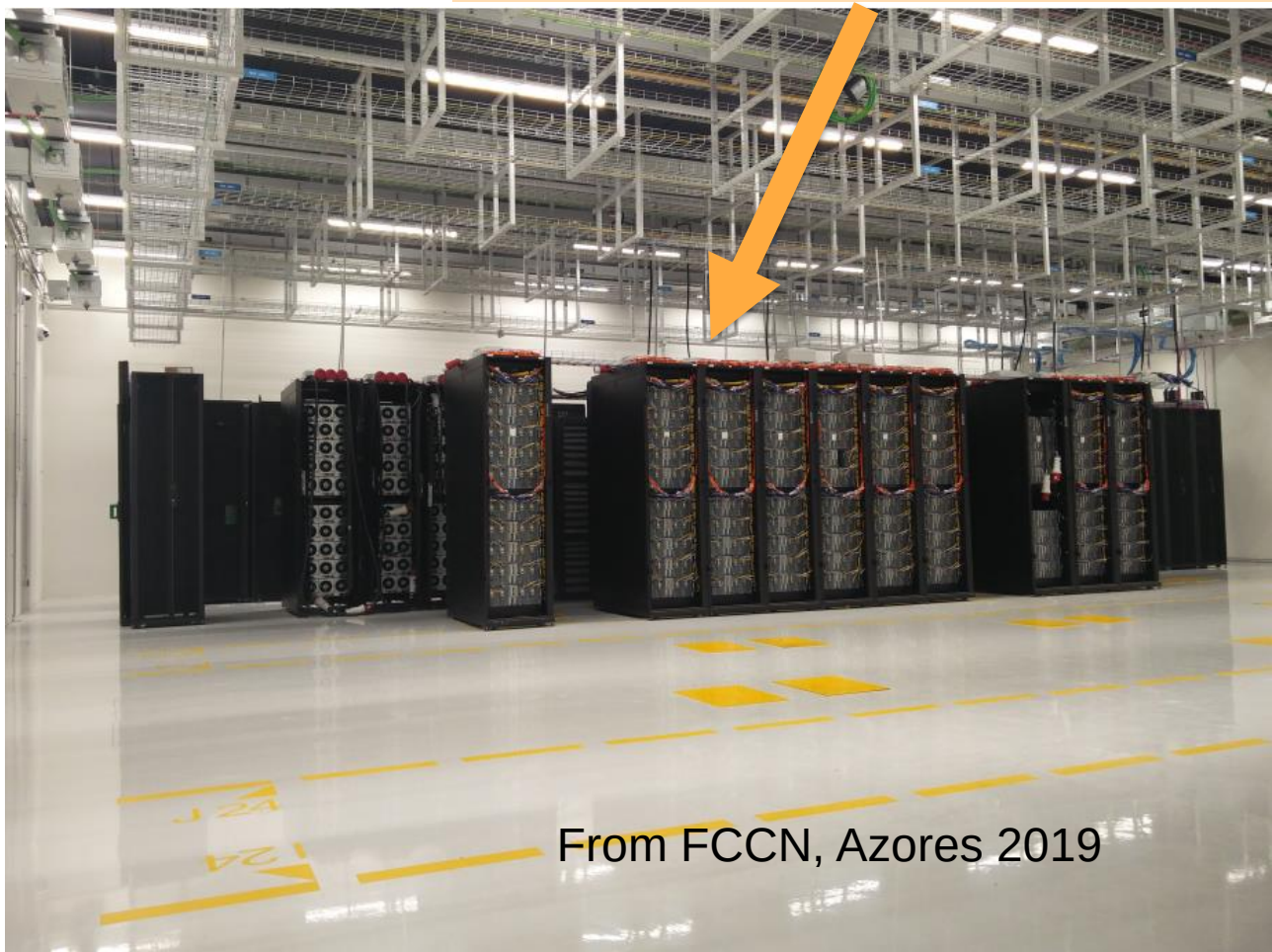
Altice DC (25 PB)

RNCA – estado atual

- Cluster#1 – **Bob** – ex- Stampede-1, cedido pelo TACC
- Alojado em Datacenter desde 21-Março-2019

- Datacenter REN + NOS

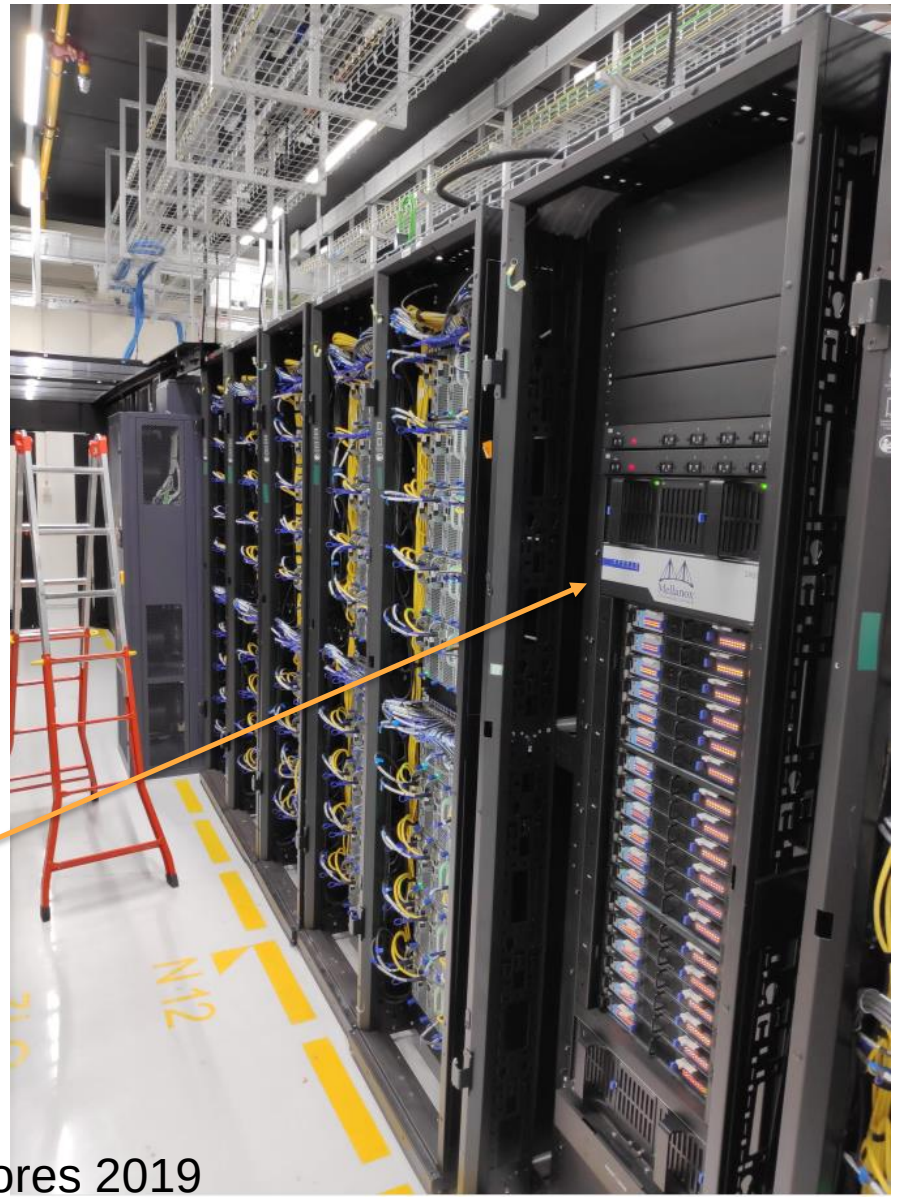
Cluster “Bob”



From FCCN, Azores 2019

RNCA – estado atual

- Cluster Bob – em instalação
- 800 compute-nodes, cada um com
  - 2x Xeon E5-2680 (8 cores cada)
  - 32 GB- RAM
- Total de 12.800 cores = 800 x 2 x 8
- Total de RAM: 25 TB
- *Interconnect* Infiniband
- Total disco: ~1,6 PB



From FCCN, Azores 2019

Storage & processing dimeniosing

- Datacenter Altice – Covilhã (25PB, PUE<1.2)

- **SRC: proposal presented to FCT/FCCN**
  - **RNCA in consolidation**
  - **need to factor in this policy**
  - **White paper prepared to FCT**

- **Prototyping activities (middleware, science, FAIR)**
  - **Close partnerships with industry (CMMI level5, Agile) for science data flow development**
- **3 FTEs engaged**
  - **Collaboration on Prototype of MeerKAT-EU e-infras federation (IDIA, INAF, UMAN, IAA-CSIC)**

Towards Radioastronomy and Space Science

Portugal report: Enabling Green E-science

DarkSky® Aldeias do Xisto: à luz das estrelas

Fundação Starlight visita o território no âmbito do processo de certificação Starlight Tourist Destination