

ENAbling Green E-science for SKA

Capacitation and Sustainability of Portuguese participation in the SKA



Radioastronomy as an Open Innovation Living Lab A National Infrastructure

5 Academic Partners

1 Interface Institutions

7 Industry partners


1 Competitvity Cluster




3.8M€ (2017-2020) - ESFRI aligned; Excellence



**Operate Infrastructure in Portugal: towards world class facilities;
in Cooperation with AIR ; Sensors + Compute; HR Capacitation**



◆ Excellent Science



◆ Dependable Technologies
for critical systems



◆ Big data, Cloud, Exabyte
communications



◆ Sustainable Energy
systems

Building on projects



Prep SKA (FP7 -2011) A Preparatory Phase proposal for the SKA



Biostirling 4 SKA (FP7, 2013-2017, €6M)- A cost effective and efficient approach for a new generation of solar dish-Stirling plants based on storage and hybridization



AENEAS (H2020, 2017-2019, €3M) - Advanced Network of E-infrastructures for Astronomy with the SKA – towards an EU, federated Regional Centre



ESI-SKA (2017-2020, IAPMEI, €8M) – Intelligent Ecosystem for the SKA;



ENGAGE SKA Goals:



- Continue to **support National and International Agencies** in the Pre-Construction Phase of the SKA
- Foster **Science Presence and Human Capacitation**, presence in SKA Working Groups (6 Scientists; 11 chapters –SKA Book)
- Maximize the non-astronomy industry opportunities from SKA, including **Big Data, Energy Efficiency** etc.
- Foster regional **research/industry connections** to broader Global linkages – **establish long-term tech Demonstrators in PT**
- Provide an **industry-led catalyst** for informing **national strategy** regarding **Big Data, Energy and Environmental sensors**
- Develop **SKA industry consortia**; develop example for future industry consortia-building (Research - Innovation - Market)

SKA: non-Astronomy Opportunities



Big Data: cloud computing, processing, transport, Storage, Internet of Things



Communications: sensor networks, infrastructure, NRENs, services



Power: Renewables R&D+I, Smart grid, reliability & provision



Construction: remote location, infrastructure, maintenance



Smart Manufacturing: material, design and systems engineering

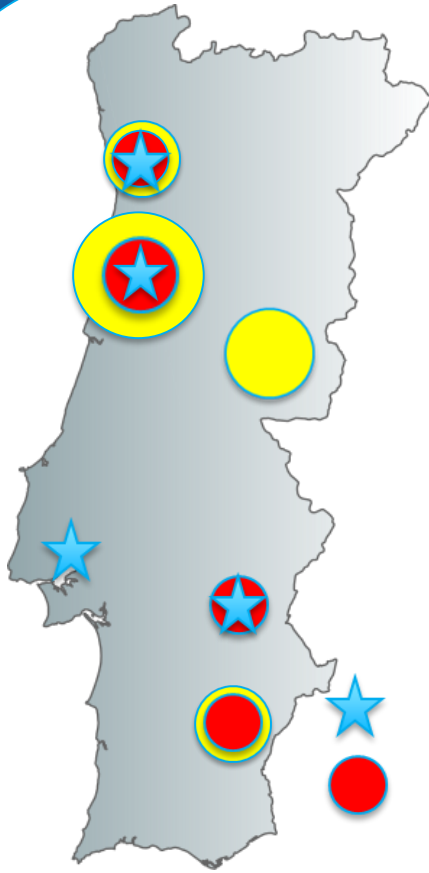


Skills & Capacitation: training and expertise, Training exchange

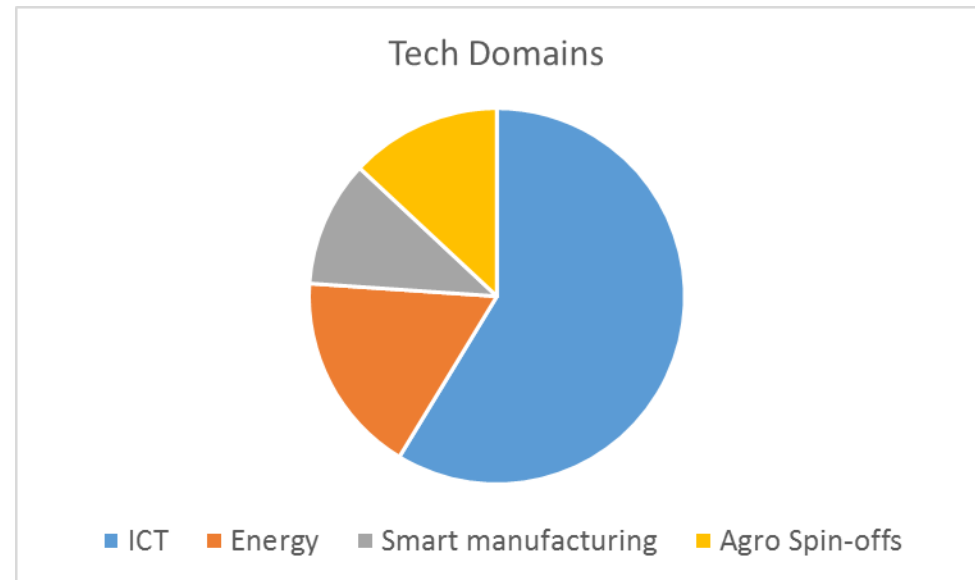
SKA expected Intensity domains

Interlocutor for Green ICT

(2014-2018)



Science
Tech in academia
Industry Intensity

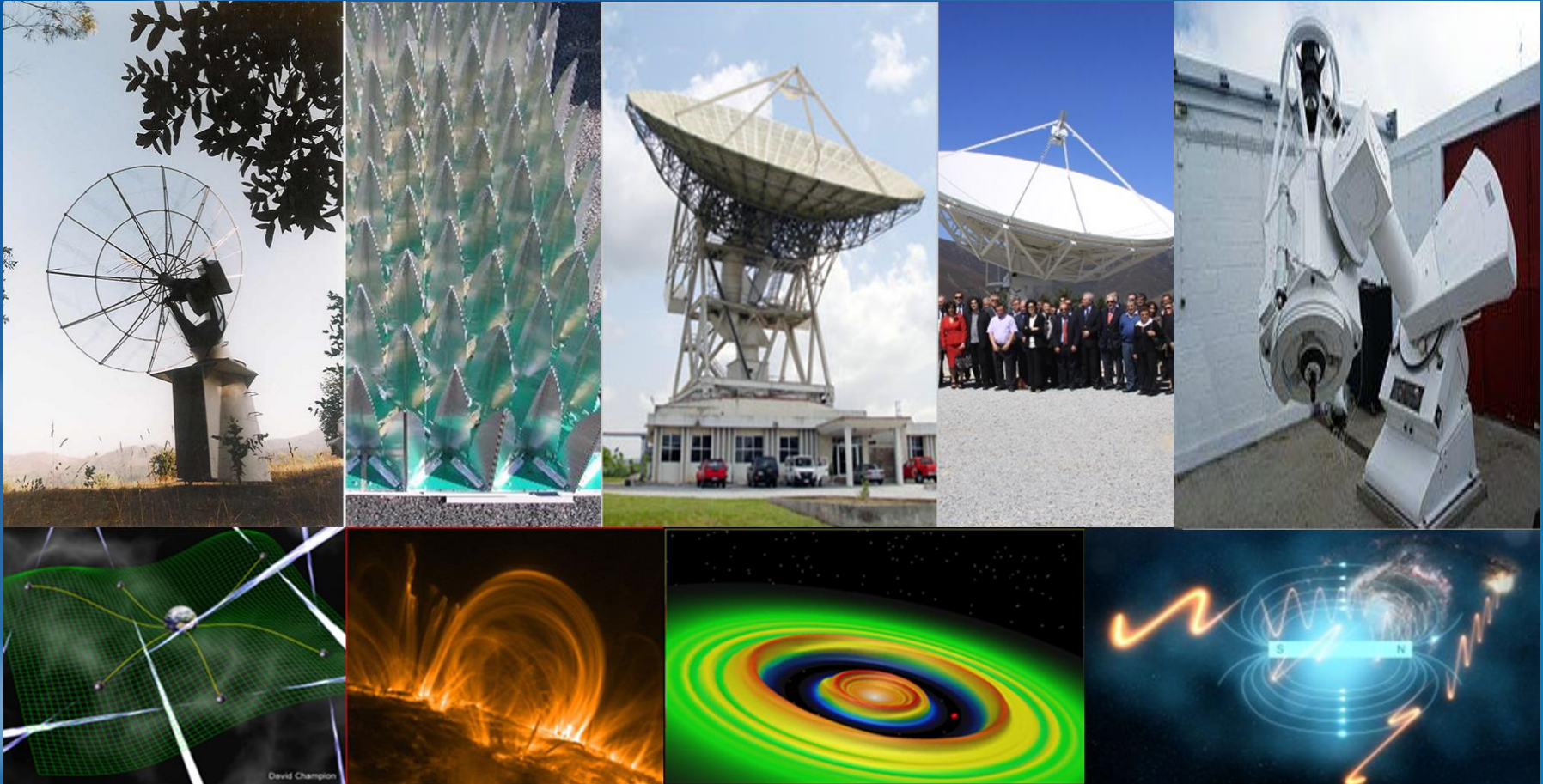


ICT+Energy - dominant

Radioastronomy:

Infrastructures – synergic with AIR

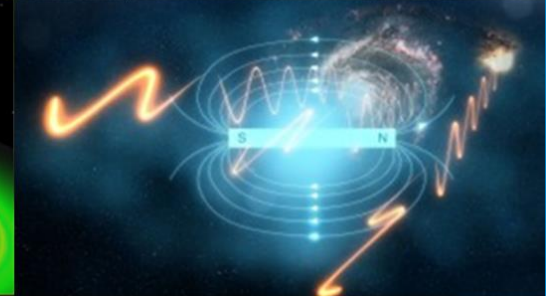
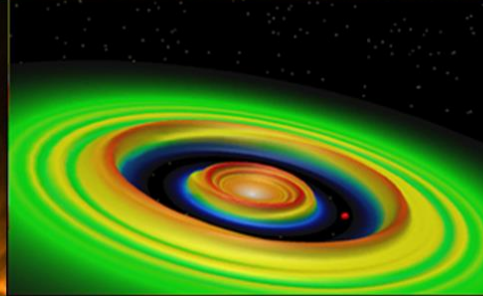
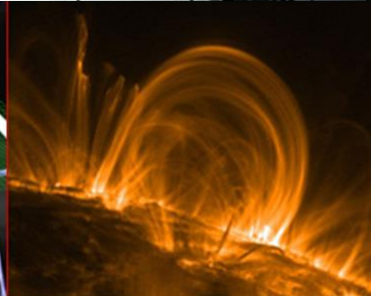
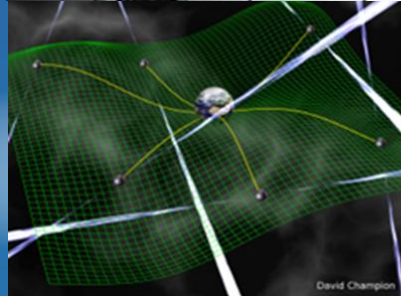
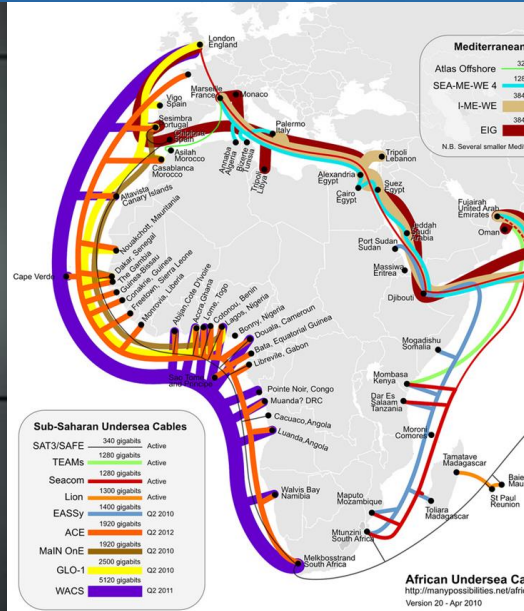
ENGAGE
SKA
PORTUGAL



Initiating new program: SST pilots (Funded) , Dark Sky (Funded)

Radioastronomy: Cyber-Infrastructures

ENGAGE
SKA
PORTUGAL



Curate, Store, Service : 3% of SKA1 in Portugal

SKA : World Innovation Leadership

A program for the next decade



SKA Consortia Work Packages for Industry

Portugal in Roadmap of Great Design : Industry Leadership

Clustering Agreed Investment : **8FTEs, 2M€.**

Telescope
Manager



Dishes



Signal & Digital
Transport



Science Data
Processor



Infrastructure
(Power)



Mid Frequency
Array



- Some Perspective

SKA Science Archive

searches on
Google
98PB

uploads to
facebook
180PB

YouTube
15PB

CERN
15PB

LOFAR
Long Term Archive
23PB

NSF
6PB

CONSERVATION CENSUS
4PB

NASDAQ
3PB

LIBRARY OF CONGRESS
5PB

PER YEAR
1 Petabyte

SKA
Phase1 Science Archive
300PB

**World Bank report (average of 40 countries):
Paved roads: 1M€ per 1Km**

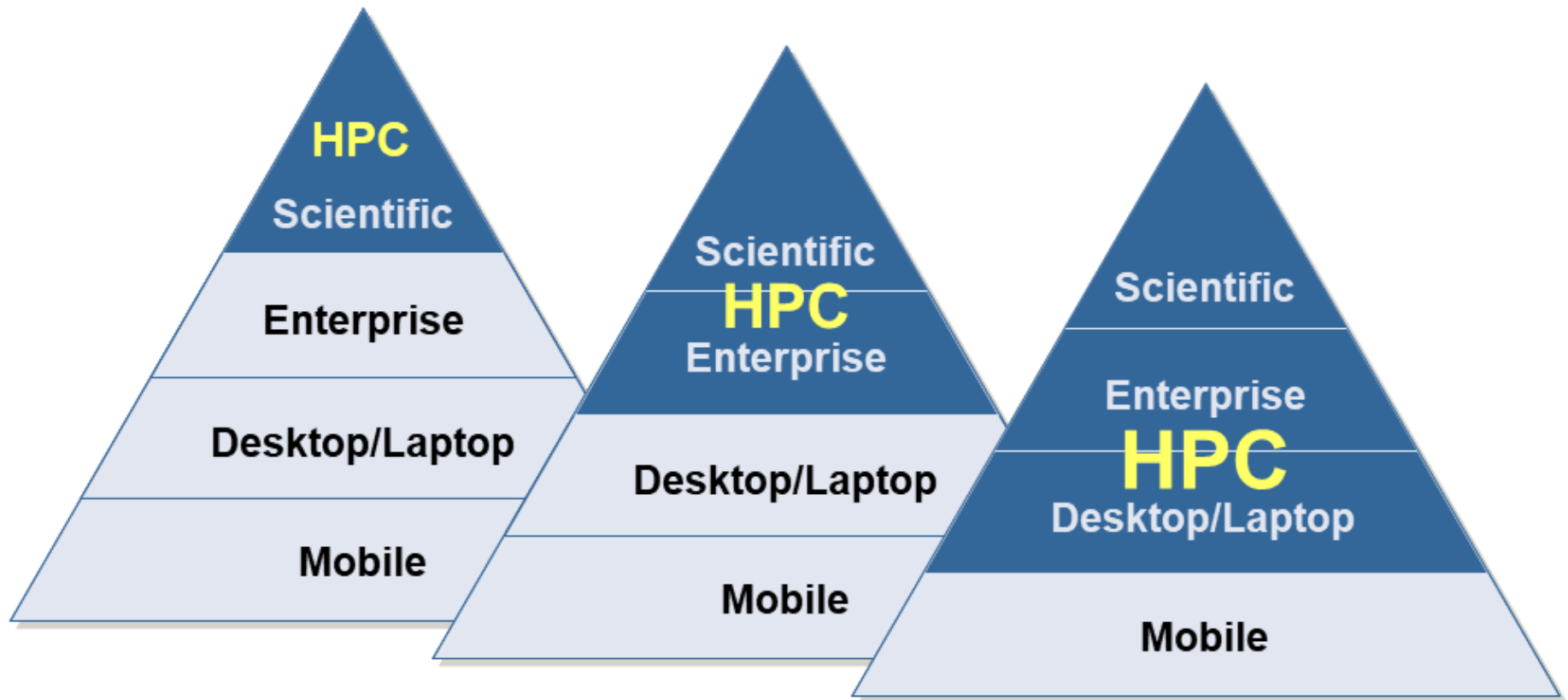


**Being part of Global
Knowledge Economy**

**SKA fiber optics : wrap twice
around the Earth ! 80 000 Km!!
("digital roads" - cheaper)**



The Big Data HPC convergence



Industry: Why get engaged now?

SKA Industry engagement is anticipated to fall broadly into four areas:

Innovation – high performance, reliable products & services

• **Strategic positioning** (specialist exchanges and training, technology mapping, programmatic information and tools); **NOW**

• **Industry development** (business creation, IP generation, teaming, supply chain development); **NOW**

• **Industry participation**; (contracts awarded, jobs and skills maintained and expanded, industry collaboration with academia). **SOON**

2-3

4-5

6-7

8-9

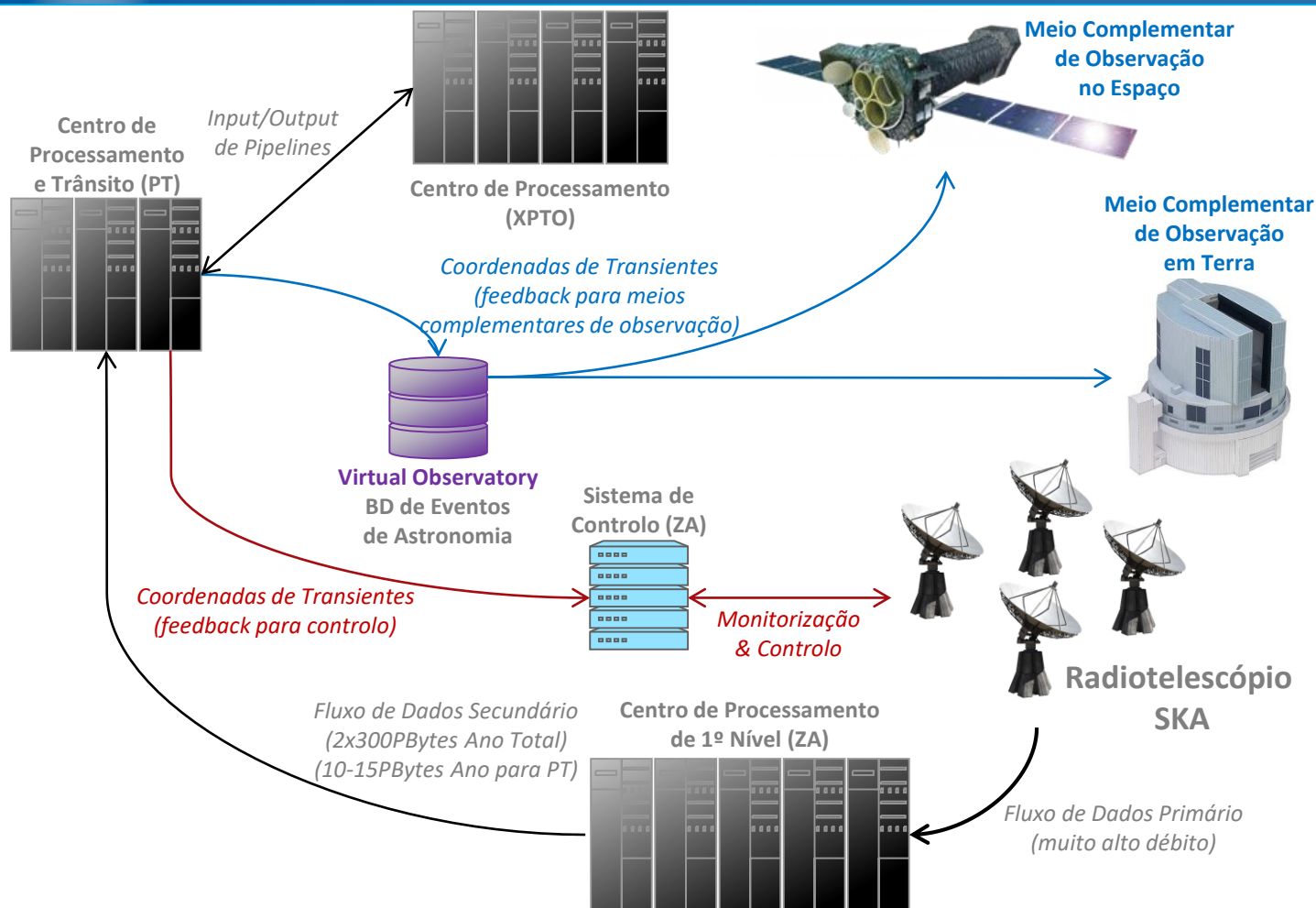
TRL

And the pot at the end of the rainbow:

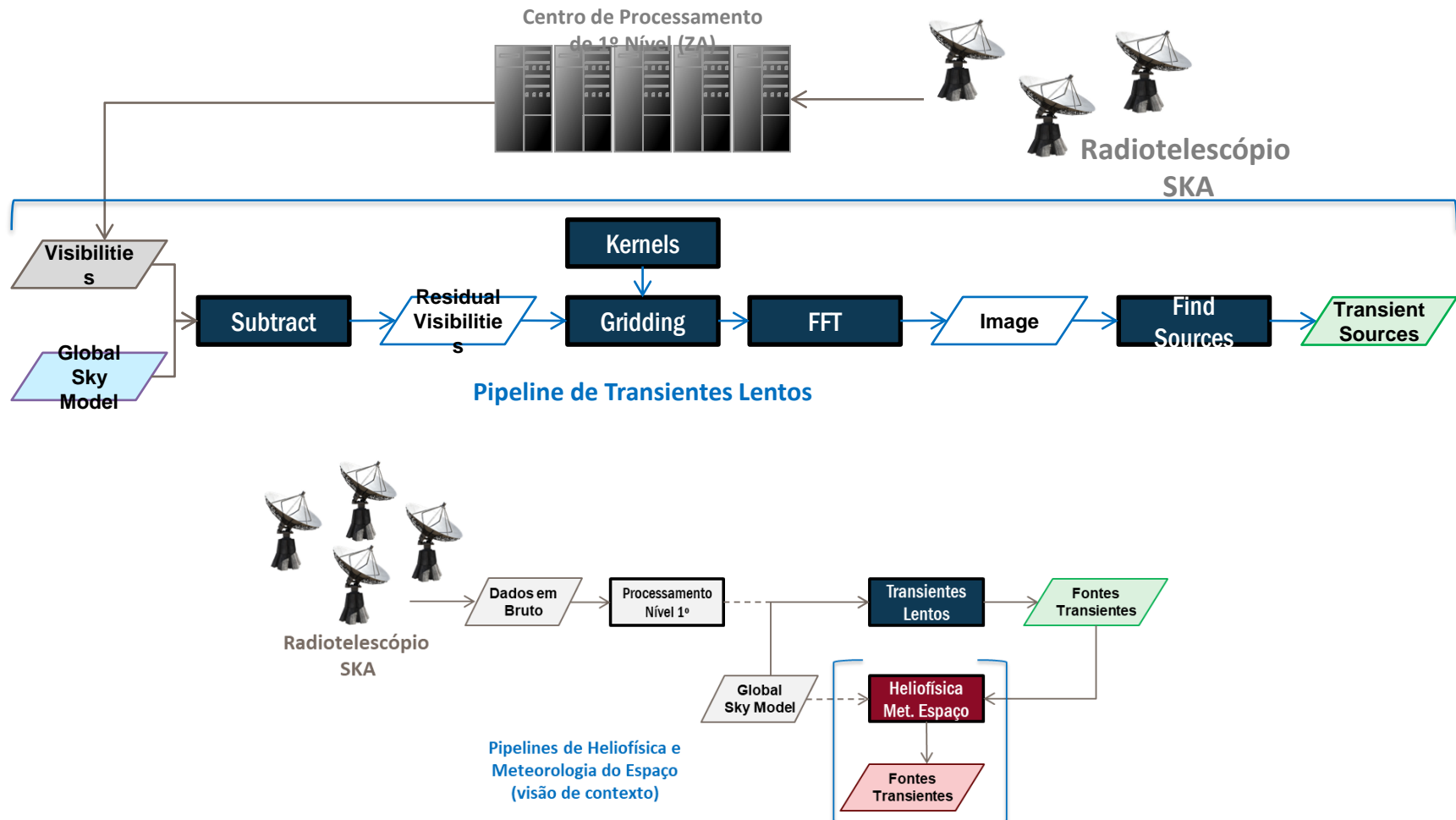
- Pre-Construction Phase - €150 million (2013-2016)
- SKA (Phase 1) - 674M€ (2017-2020)
- SKA (Phase 2) - €2 billion (estimate)

The SKA Big Data system.

ENGAGE
SKA
PORTUGAL

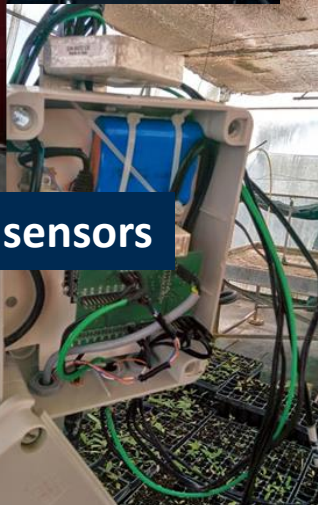


RAPPTOR – RA Pipeline processor.





MeerKAT, Karoo, 2015
EC-OUA Co-Location Workshop
Pretoria, 2015



Space + Agro sensors



Energy meets SKA in
Portugal