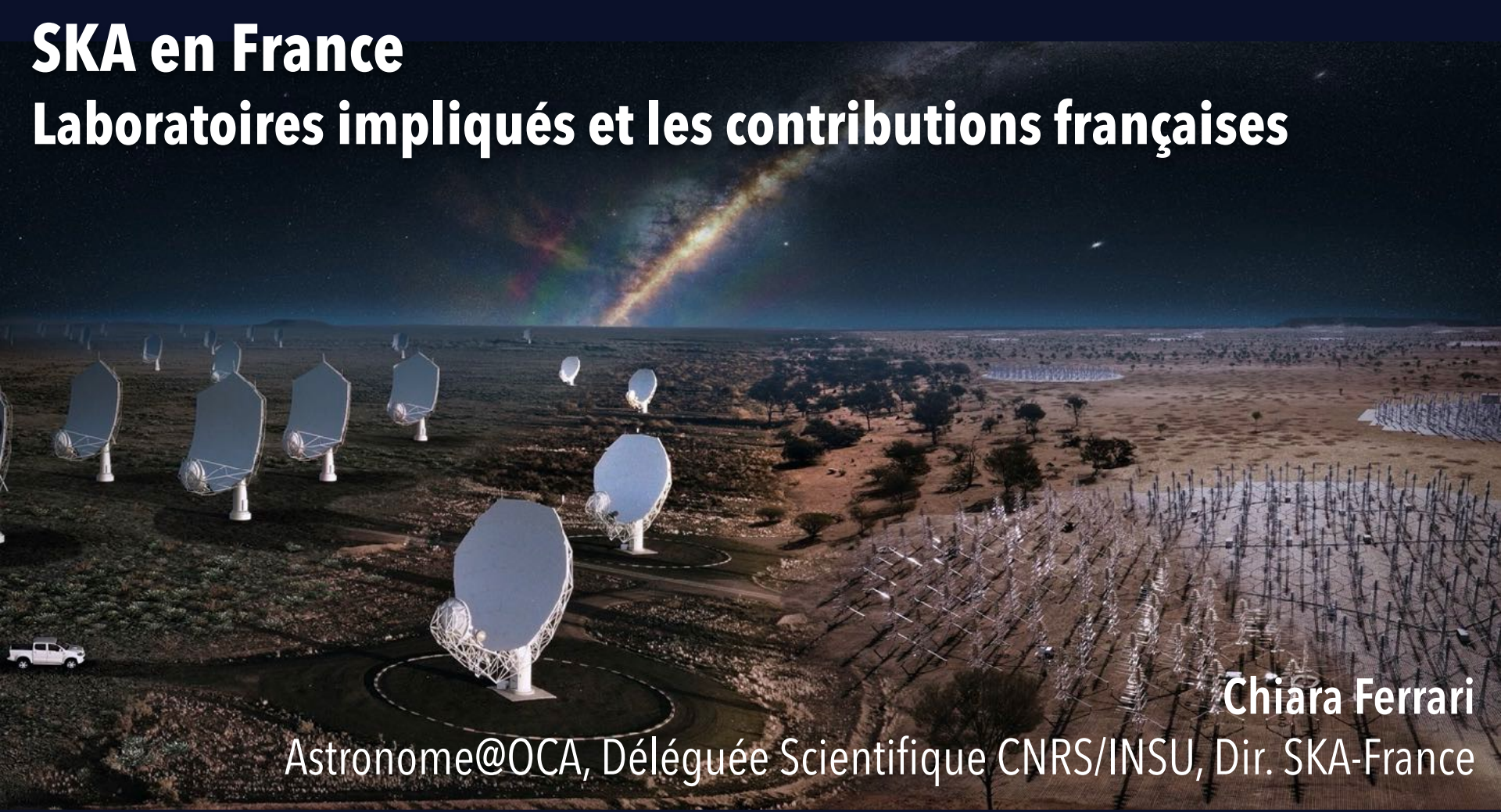
SKA en France
Laboratoires impliqués et les contributions françaises



Chiara Ferrari
Astronome@OCA, Déléguée Scientifique CNRS/INSU, Dir. SKA-France

Why SKA-France ?

Adequacy with the "Big Questions" of the community

2014-2015

Link to the full document

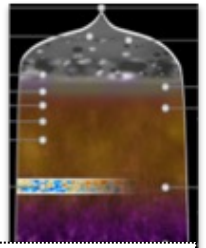
Priorités pour de nouveaux moyens d'observation

Instrumentation E-ELT	L'E-ELT demeure la première priorité de la communauté. La participation au niveau co-I aux instruments de première lumière CAM et IFU, au niveau PI à l'instrument MOS, ainsi que la participation à l'instrument suivant METIS, sont une priorité. Priorité P0 : MOS (niveau PI) Priorité P1 : HIRES Projet à murir : PCS
Infrastructures de type TGIR	NOEMA reste un projet prioritaire de la communauté dans la catégorie des méso-équipements ~~Priorité P0 : CTA~~ Priorité P0 : ticket d'entrée dans SKA
Participation à des infrastructures multilatérales	Priorité P1 : LSST Priorité P1 : CCAT
Nouvelle instrumentation sur infrastructures existantes	Priorité P0 : WEAVE Priorité P1 : NenuFAR Priorité P2 : 4MOST
Projets à plus long terme dont il faut soutenir la préparation	Priorité P0 : MSE Priorité P1 : EST

Why SKA-France ?

Adequacy with the "Big Questions" of the community

2014-2015



Quelle est l'histoire cosmique des baryons?

Epoch of Reionisation & Cosmic Dawn

Dans quel univers vivons-nous? Quelle est la nature de la matière noire?

Cosmology

Génération des champs magnétiques et impact sur l'évolution des structures

Cosmic magnetism

Quelle est l'histoire cosmique des baryons? Quels processus physiques régissent l'évolution des galaxies et leur cycle de matière?

Galaxy evolution

Comment explosent les astres? Quelle est l'influence des objets compacts sur leur environnement?

The transient sky

Quel ciel nous révélera l'astronomie des ondes gravitationnelles? L'hypothèse d'équivalence d'Einstein est-elle un principe exact de la physique? La relativité générale est-elle la bonne théorie métrique de la gravitation?

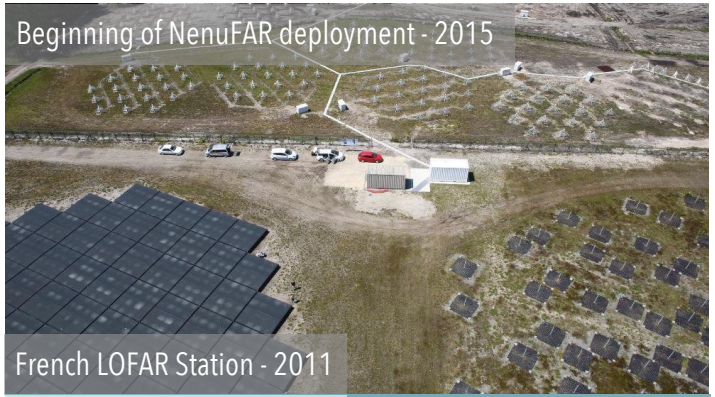
Fundamental physics & Compact Objects

Comment se forment les étoiles et les planètes? Molécules organiques complexes dans les régions de formation stellaire. Exoplanètes. Soleil et magnétosphère planétaire

Planetology & Cradle of Life

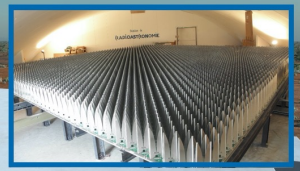
Why SKA-France ?

Challenges motivating French innovation



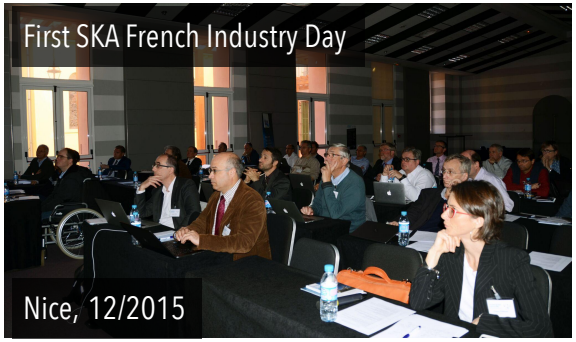
French LOFAR Station - 2011

EMBRACE prototype - 2010



@ Nançay

@ Nançay & Bordeaux



THALES · AIRBUS SAFRAN LAUNCHERS · IBM · fedd · ENGIE · NOKIA · Callisto · KALRAY · Alcatel·Lucent · DDN STORAGE · Schneider Electric · AEG · EDF · TOTAL · SAFT · NVIDIA · intel · BULL · AIR LIQUIDE · Alcatel·Lucent · Air Liquide

Milestones of SKA-France

November 2019

Two new partners of Maison SKA-France

& New INSU/AA Prospective

July 18, 2018

CNRS becomes member of SKA Organisation

May 17, 2018

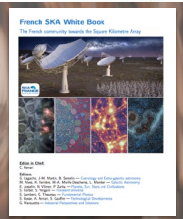
SKA inscribed as a project in the French Roadmap for Research Infrastructures published by MESRI

February 1st, 2018

Launch of Maison SKA-France

October 16, 2017

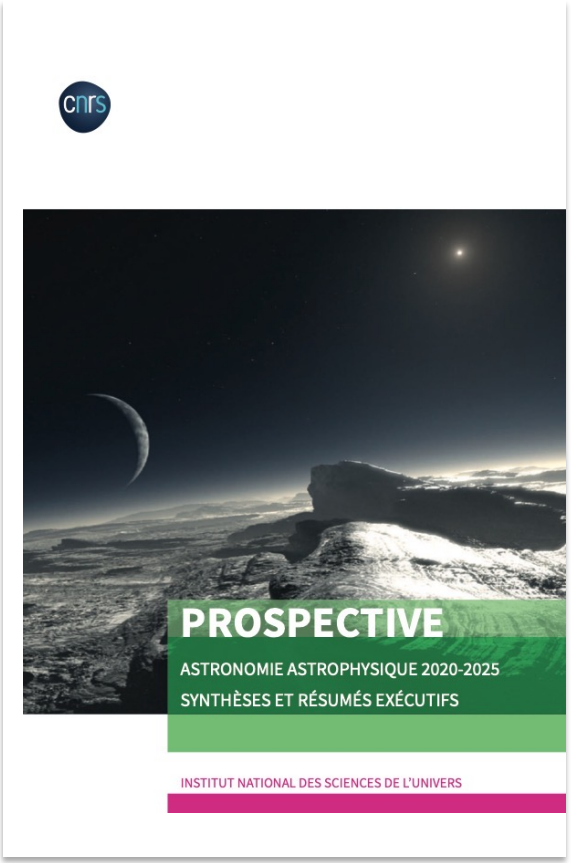
First SKA-France Day



July 1st, 2016

SKA-France Coordination

"Prospective INSU AA" published in 2019



Priorité	Justification	Thématiques cibles	Missions spatiales engagées en synergie avec le moyen sol
INFRASTRUCTURES DE TYPE TGIR			
P0 : SKA	Apport d'un saut technologique (sensibilité, champ de vue instantané, multiplexage, etc.) permettant des avancées considérables sur un ensemble de thématiques très variées et d'intérêt majeur pour la communauté.	Aube cosmique, réionisation, évolution des galaxies et grandes structures, milieu interstellaire, disques protoplanétaires, formation stellaire, champs magnétiques, objets compacts, ciel transitoire, physique fondamentale, ondes gravitationnelles *via* les pulsars	JWST, Euclid, LISA, SVOM, Athena

Link to the full document

France & SKAO

April 11, 2022

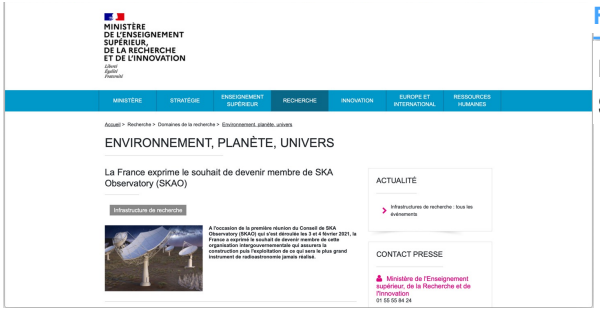
French government signs the accession agreement with the SKAO

March 7, 2022

Collaboration Agreement signed between SKAO and CNRS

May 28, 2021

Announcement of France's accession to the SKA Observatory - after SKAO Council approval - made by the French President Emmanuel Macron



February 4, 2021

France expresses its wish to become a member of SKA Observatory

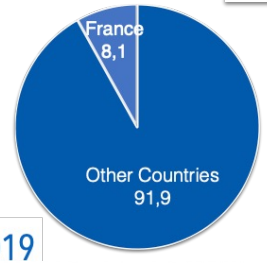
French participation in the SKAO

Science

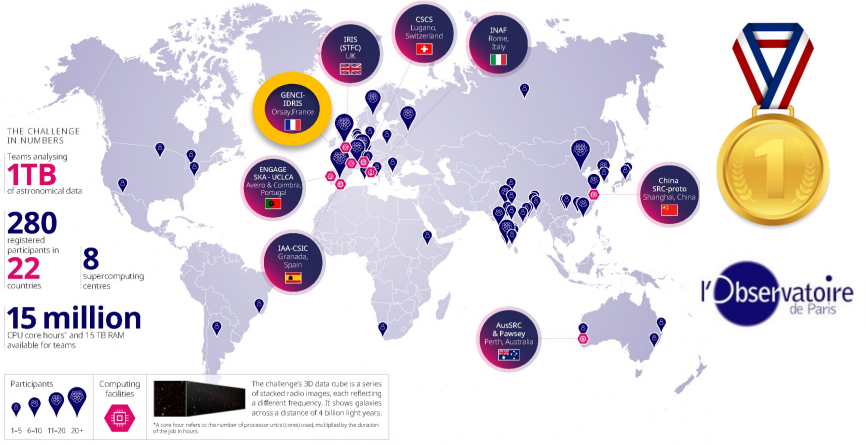
- A continuously growing scientific community preparing for the start of SKAO observations
  - Active exploitation of SKA pathfinders and precursors (NenuFAR, LOFAR, MeerKAT, ASKAP, FAST, …)
  - Participation to all SKA Science Working Groups
  - Wide and recognised methodological expertise in data processing and analysis
  - The SKAO challenges interests a wider community of researchers, not only astronomers

2014

2017



2019

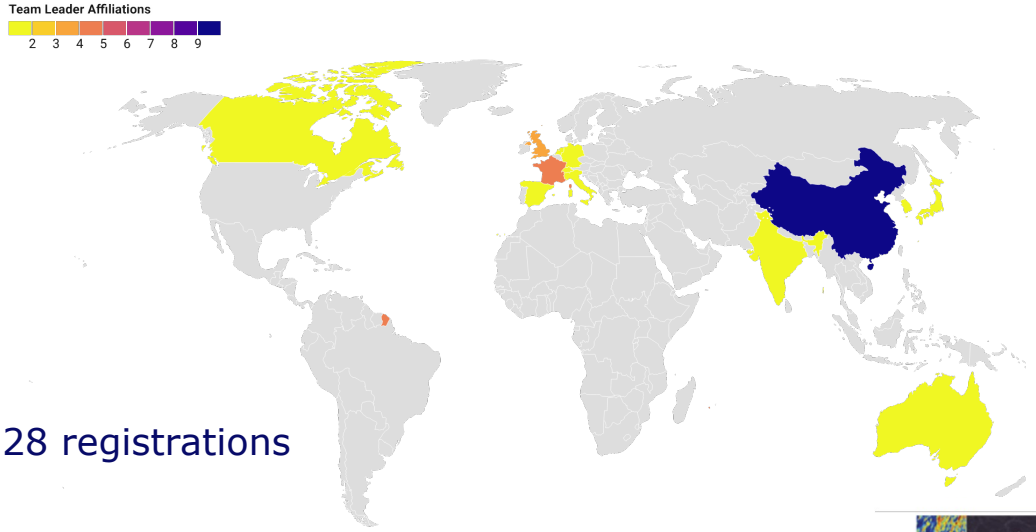


France 2030 : 600 M€ pour 13 nouveaux programmes de recherche exploratoires

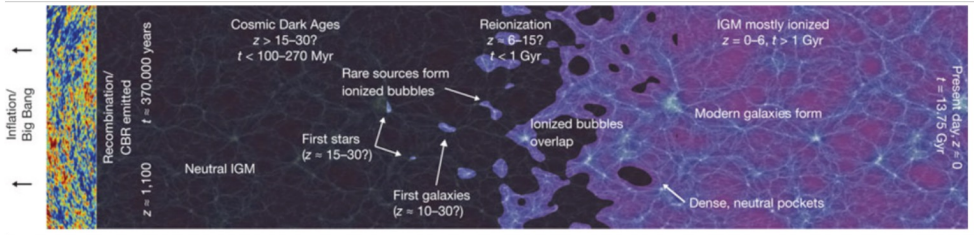
NumPex | Numérique Hautes Performances pour l'Exascale

- Pilot(s) institution(s) : CEA, CNRS, INRIA
- Scientific director(s) : Jean-Yves Berthou (INRIA), Jérôme Bobin (CEA), Michel Dayde (CNRS)
- FINANCEMENT ACCORDE 40,80 M€

SDC3a Registrations



28 registrations



Credit: Robertson et al. (2010)

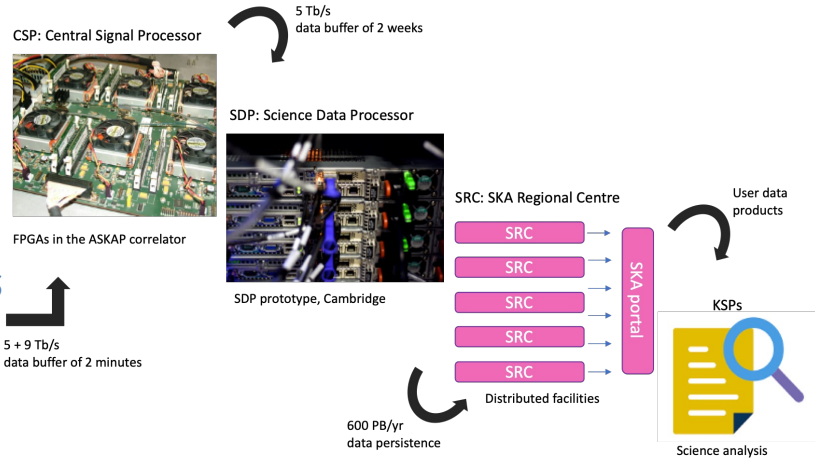
Participants of this data challenge will be tasked with elucidating exactly when (given a realistic, artificial dataset) the Epoch of Reionisation occurred. However, given that the observation itself is extremely challenging, our challenge will be broken down in to two parts:

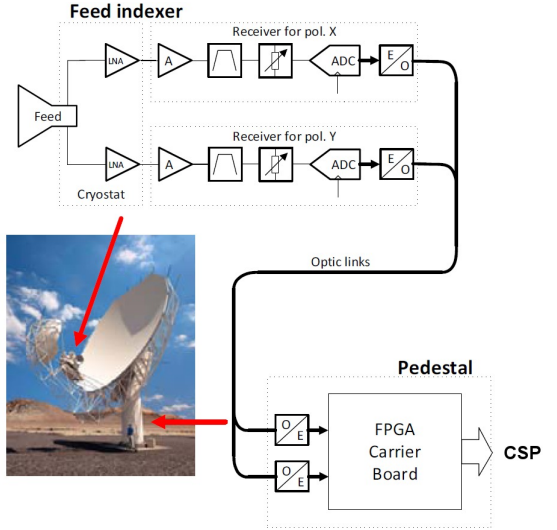
1. Removal of foreground emission from Galactic and Extragalactic sources ('Foregrounds', or SDC3a)
2. Inference of important parameters of the Epoch of Reionisation ('Inference', or SDC3b)

French participation in the SKAO

Construction & Operations

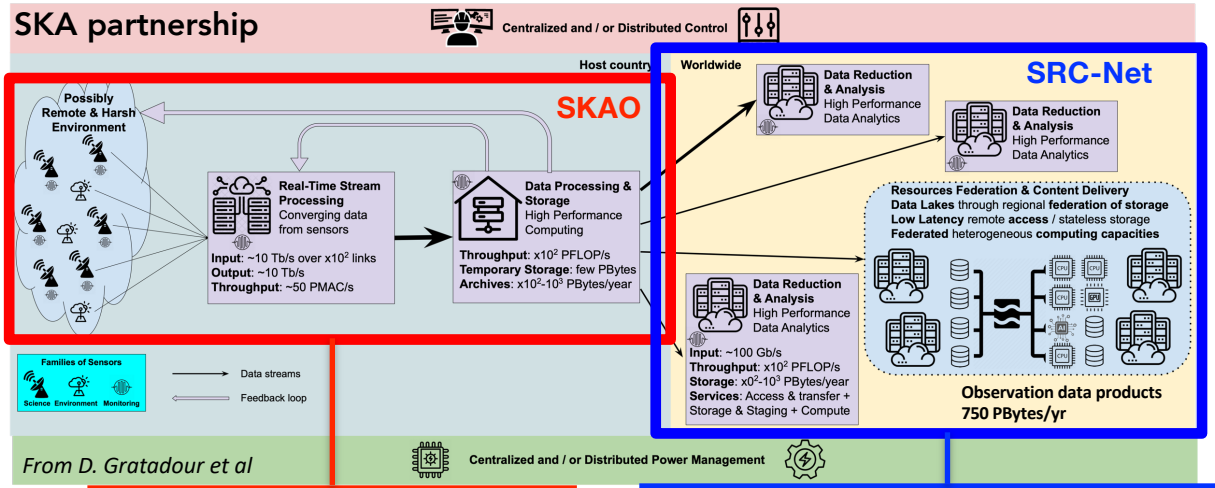
- Construction
  - Co-design & Equipment of the two sub-exascale computing centres of the Observatory
  - Supply of digital electronics for high-frequency receivers
- Strategic objectives for SKA-France
  - Environmental sustainability of the project
    - Efforts made by France in the design of future SKAO computing centres with low environmental impact
    - Study of energy solutions for SKA-MID funded in 2019
  - SKA: fundamental research as a driver for strategic innovation and collaboration between academia and industry
  - SKA Regional Centre Network (SRC-Net): a new model of End-to-End partnership
    - Governance
    - Design
    - Implementation

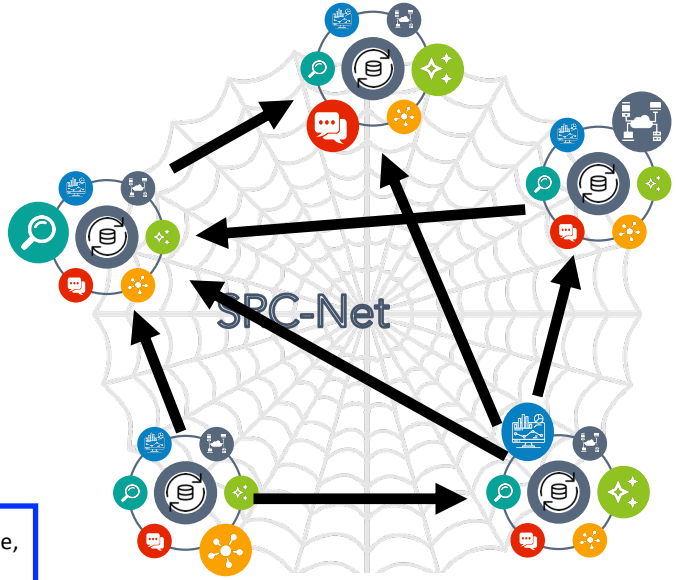




The SRC-Net

Slide/Image courtesy: J.-P. Vilotte (CNRS/INSU) & D. Gratadour (OP)





Observation data product delivery

- High-rate streaming data reduction and processing,
- Edge to centralised HPC (SPC) computing/AI and content delivery networks

Distributed Data archive and Data analysis

- Federated Exascale and hybrid Cloud platforms: storage, networking, compute, wide-area workflows, data logistics
- Logistical networking, cybersecurity and power management

Science-driven capabilities:

bridge organisational, and technological boundaries; foster major collaborative and interdisciplinary efforts across algorithmic research, software development and integration, data logistics, continuum of infrastructures and SKA science communities communities

No access to the SDPs nor to the raw SKAO data

The SRC-Net: a critical component of SKA

Federation of distributed resources including exascale systems (storage, networking, computing) to fully process, archive, curate and scientifically use SKA observation data products

French participation in the SKAO

Construction & Operations

- Construction
  - Co-design & Equipment of the two sub-exascale computing centres of the Observatory
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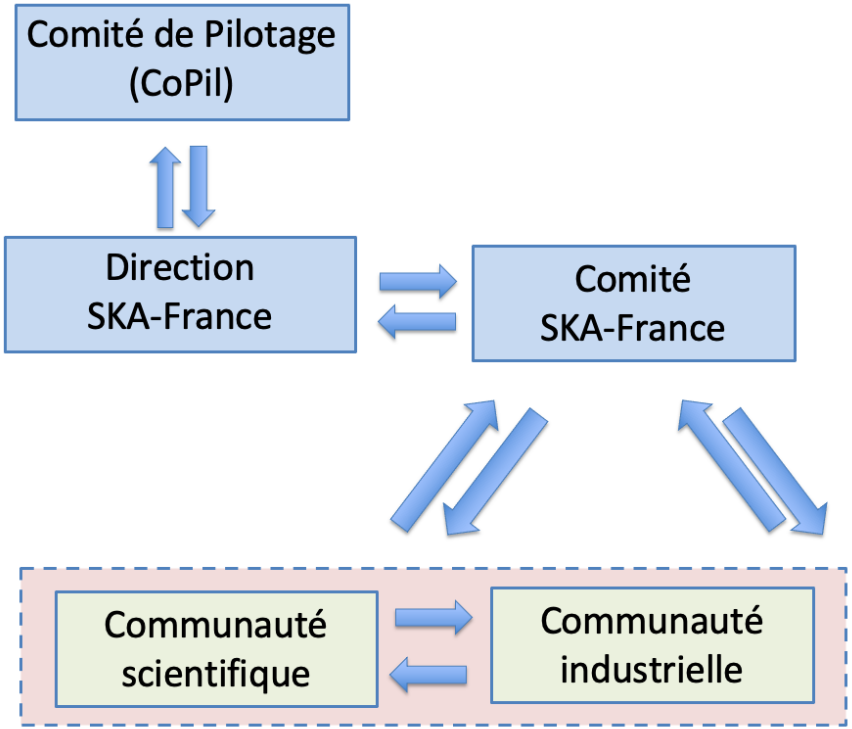
    - Design
    - Implementation

French participation in the SRC-Net

Slide courtesy: J.-P. Vilotte (CNRS/INSU)

- WG1: SRC-FR Distributed infrastructure
  - Identify and Design the distributed national resource (storage, compute, communication) infrastructure to be federated as the SRC-FR
  - This must build on a number of regional sites including national centers/GENCI, OSU, mésocentre, regional data centre
- WG2: SRC-FR software infrastructure
  - Design the architecture and the software components for the software infrastructure that need to federate the distributed resource infrastructure of the SRC-Net
  - Members with Cloud and HPC software expertise both in term of distributed data management, execution and programming environment, and data logistics, workflow management, as well as security and access policy
- WG3: SRC-FR science use cases
  - Build on a number of scientific applications (pulsar/transient, ISM, Imaging and calibration). The goal is to co-design and co-develop those applications to meet the challenges of the SKA observation data products. This should build on path riders such as NenuFAR/LOFAR and others
  - Members: scientific application developers - Links with NumPEx (demonstrators), NenuFAR and other precursors/pathfinders

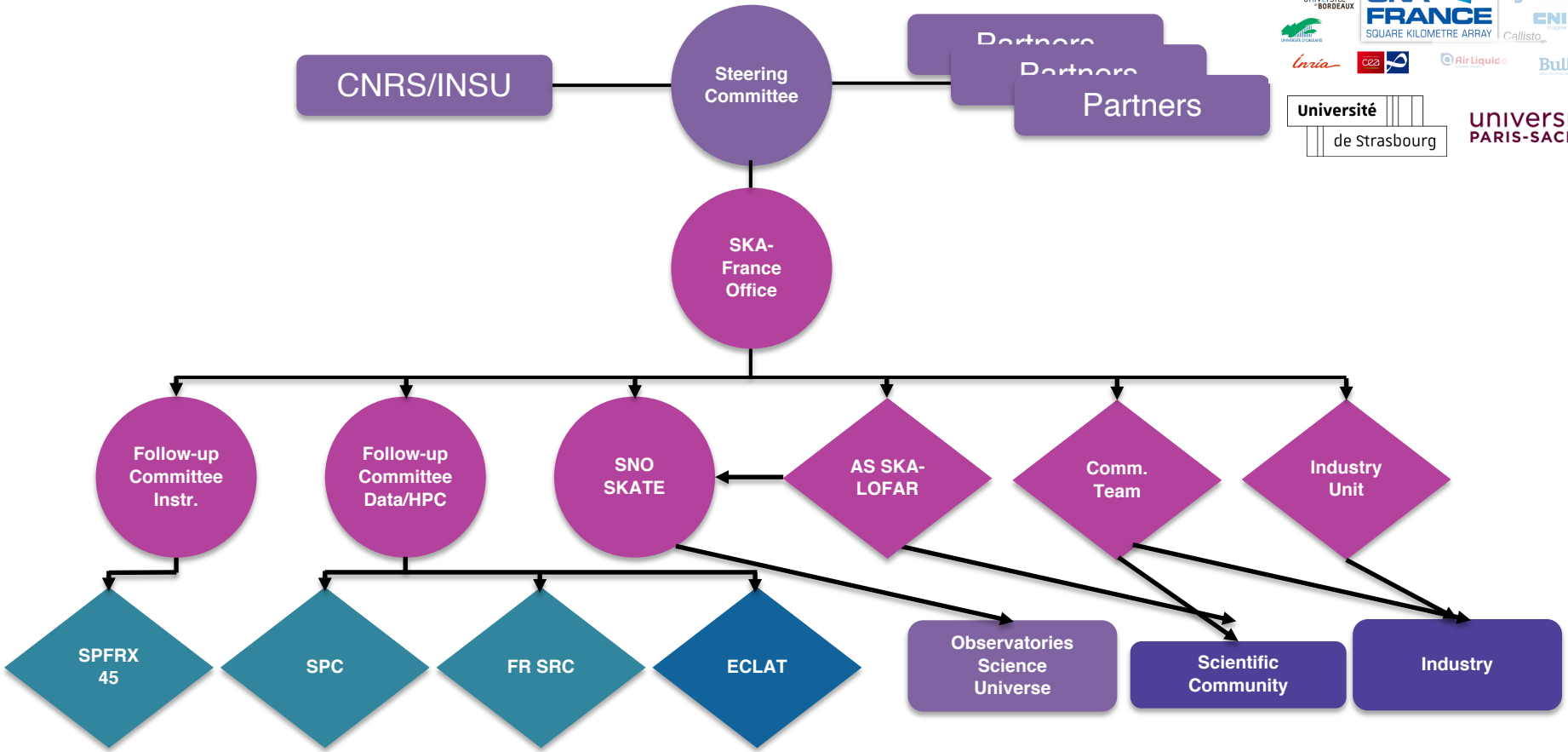
From "Maison SKA-France" …



Objective

Build a solid scientific, technological and industrial case for France joining SKAO

…to “SKA-France 2.0”



A bright path forward for SKAO and for France in SKAO

A big thank to you all!

chiara.ferrari@oca.eu