Italy: perspectives towards the SKA Regional Centre

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EUROPEAN ARC
ALMA Regional Centre || Italian

Italian approach to SRC

The recent signature of the IGO-Treaty in Rome, with the announced allocation of a significant amount of money from Italy for the construction of SKA1 testifies the interest of the Country for a 360° involvement in the SKA1 activities

INAF has already identified human and capital resources to actively participate to the ongoing SRC design activities (AENEAS and SRCSC).

It can be foreseen that **additional resources might be collected in the next 10 years** to actively contribute to set up the SRC system (modalities under investigation).

Participation into SRCSC and AENEAS is considered an opportunity to **establish a proto-SRC with a node in Italy** and to **obtain access to the system** in a fair proportion of local investments

(A. Possenti @ SRCSC first meeting)

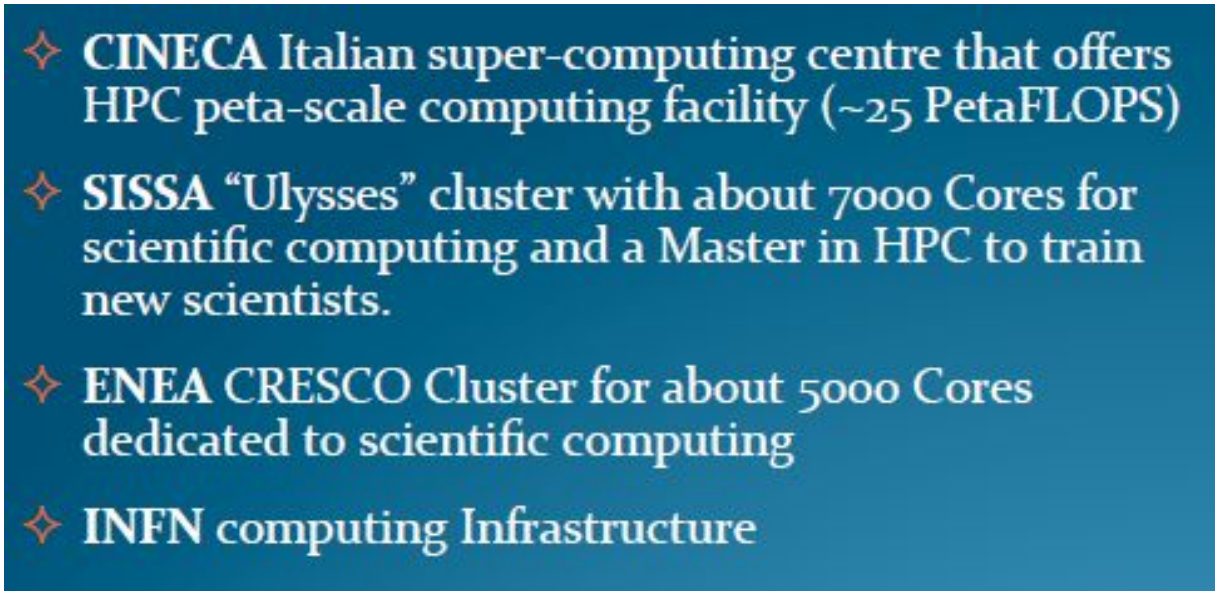
National framework

- **Italian Computing and Data Infrastructure**: includes major c institutions involved in HTC, HPC and Cloud computing: **INAF, INFN, CNR, ENEA CINECA, GARR**
- **GARR Cloud** offers cloud services to the Italian academic and research community based on open standards
- **INFN** distributed computing infrastructure for HTC and Cloud built for High energy physics experiment (LHC) with a main node (TIER-1) in Bologna

Italian Computing and Data Infrastructure

- **AENEAS**: https://www.aeneas2020.eu/ Italy leads WP5 and has task leaders in many WPs
- **ESCAPE**: https://escape2020.eu/wp_escape.html Italy leads some tasks
- **EOSCPilot**: https://www.eoscpilot.eu/ Cloud Project where INAF participate in main activities and is involved in porting software analysis tools in the cloud (EOSC)
- **Exanest**: http://www.exanest.eu/ European Exascale System Interconnect and Storage
- **EuroExa** https://euroexa.eu/ co-design of innovative exascale system: INAF is involved in the co-design of Exascale infrastructure with the application porting

National computational resources: HPC



- INAF capabilities count up to **25 PFLOPS distributed in different institutes**
- INAF has an MOU with CINECA

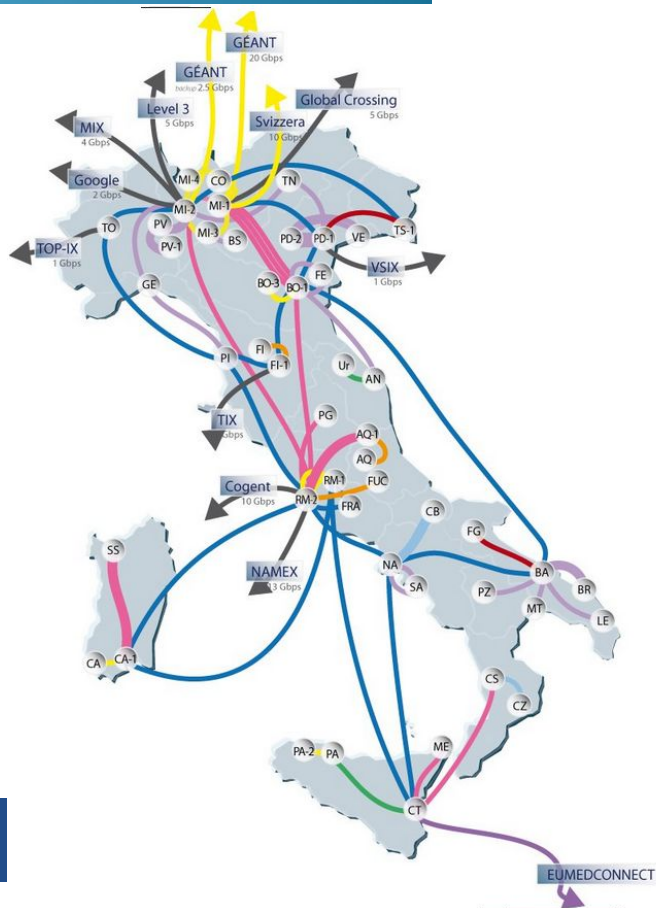
- Experienced INAF national service computational resources
  (CHIPP cluster for HPC yearly call)

National computational resources: storage and network

- INAF cloud service offers a EOSC compatible cloud access to computing and storage resources based on OpenStack
- INAF archive/storage
  - IA2 data center (0.5 PB on disk + 8 PB on tape)
  - SRT data center (2.5 PB on disk + 8 PB on tape)
  - VLBI correlator (0.5 PB on disk)
  - More than 3 PB on disk shared across several structures and project

- **GARR** national infrastructure

  Backbone 400 Gbps up to 1 TBps soon
- some **INAF** Structures and Observatories on 10 Gbps at the moment:
  - Antennas VLBI (SRT, Mc, Nt) ⇒ 10 Gbit/s
  - OATrieste ==> 10 Gbit/s
  - IRA Bologna ==>10 Gbit/s (VLBI correlator)
  - Upgrading to 10 Gbit/s: OACAgliari , OACatania



INAF activities useful for SRC: IA2

The Italian center for Astronomical Archive is a research e-infrastructure project that aims at

- coordinating initiatives to improve the quality of astrophysical data services
- facilitating access to this data for research purposes.
- managing data archiving systems and safety, including data hosting and data curation and preservation, data and metadata distribution over geographical sites, access services including publication within the VO scenario
- providing services and tools to the community, like data sharing (owncloud), project management (redmine), software collaboration (git-lab) and has available a workflow manager (Yabi) for computational needs.

Leader of sub-tasks in AENEAS WP5 and WP6

www.ia2.inaf.it

INAF activities useful for SRC: pathfinders & KSP

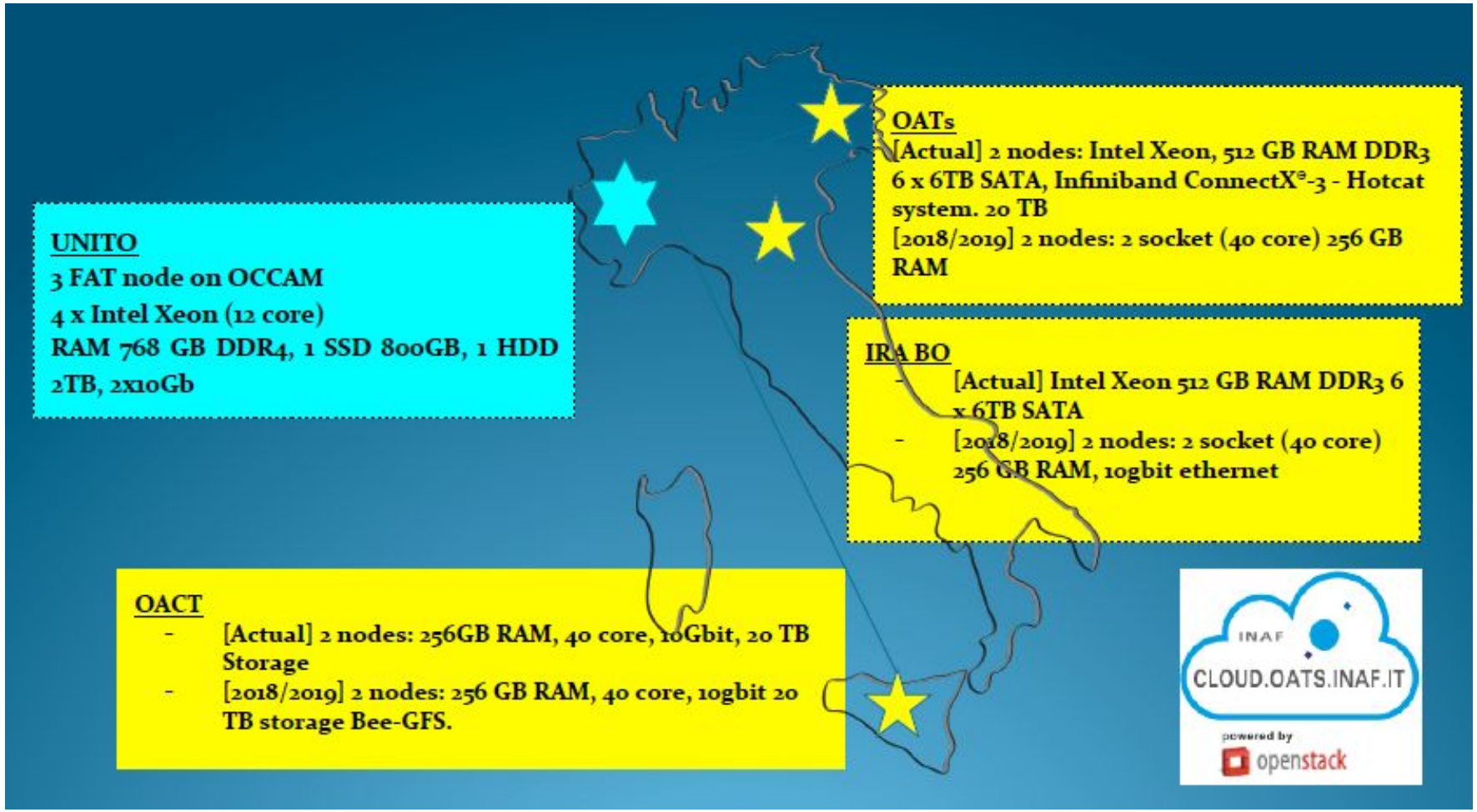
Contribution to pathfinders/precursors

- LOFAR pipeline parallelization
- ASKAP source finding tools
- Meerkat structure recognition
- MeerKATHI pipeline parallelization
- VLBI pipelines
- SKA Data Challenges

Participation in KSP:

- >8% of participants to all the KSP
- Chair of Our Galaxy
- Chair of EOR
- Ex-Chair of Pulsars
  Continuum EG Science
  Magnetism

INAF facilities useful for SRC: pathfinders & KSP

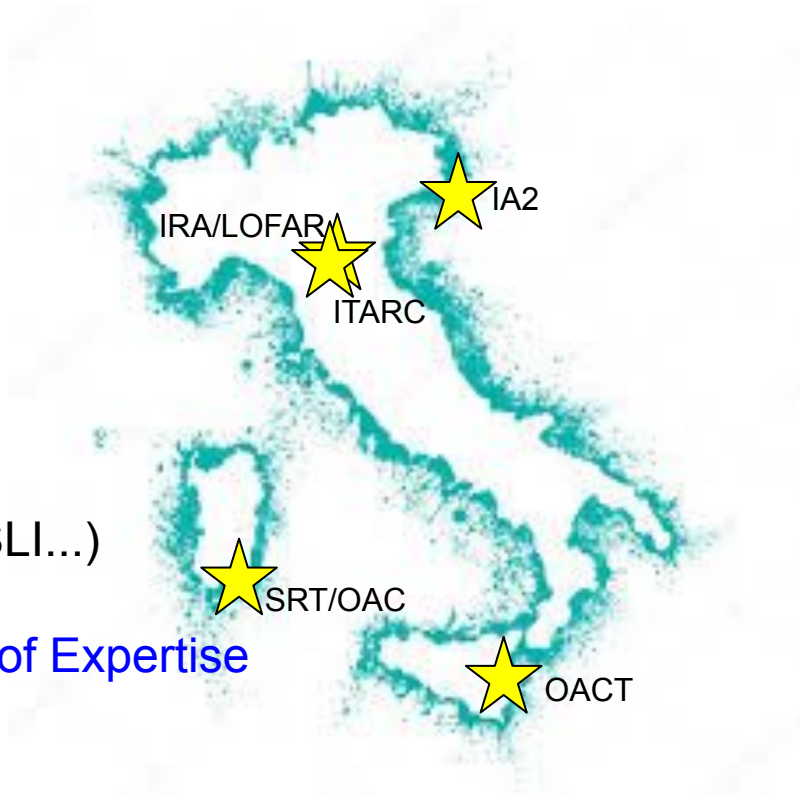


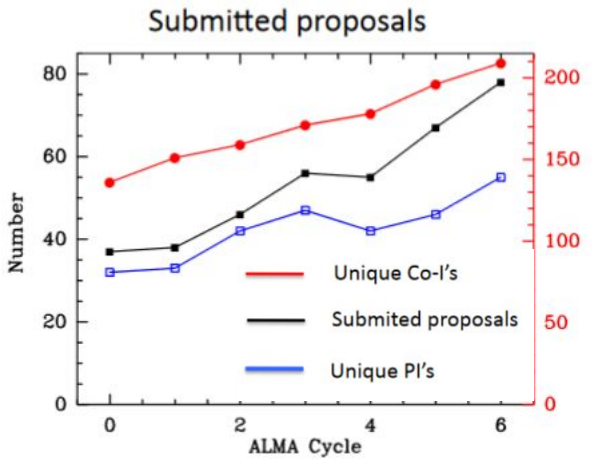
LOFAR computational infrastructure includes several sites
A LOFAR station will be located in Medicina (Bologna)

INAF activities useful for SRC: IT-ARC

The Italian Node of the EU – ARC since 2009:
- provides support in all the stages of ALMA projects
- formed and informed the community
- contributes to telescope commissioning
- contributes to CASA development
- contribute to Quality Assessment of telescope products

- ARI-L development project for ALMA Archive
- Leads the network wg for Archive Data Mining
- Analysis software development (KAFE, CACAO, MUESLI...)
- Participates to network WGs
- Included in the EU Network for Interferometric Centres of Expertise





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http://arc.ia2.inaf.it

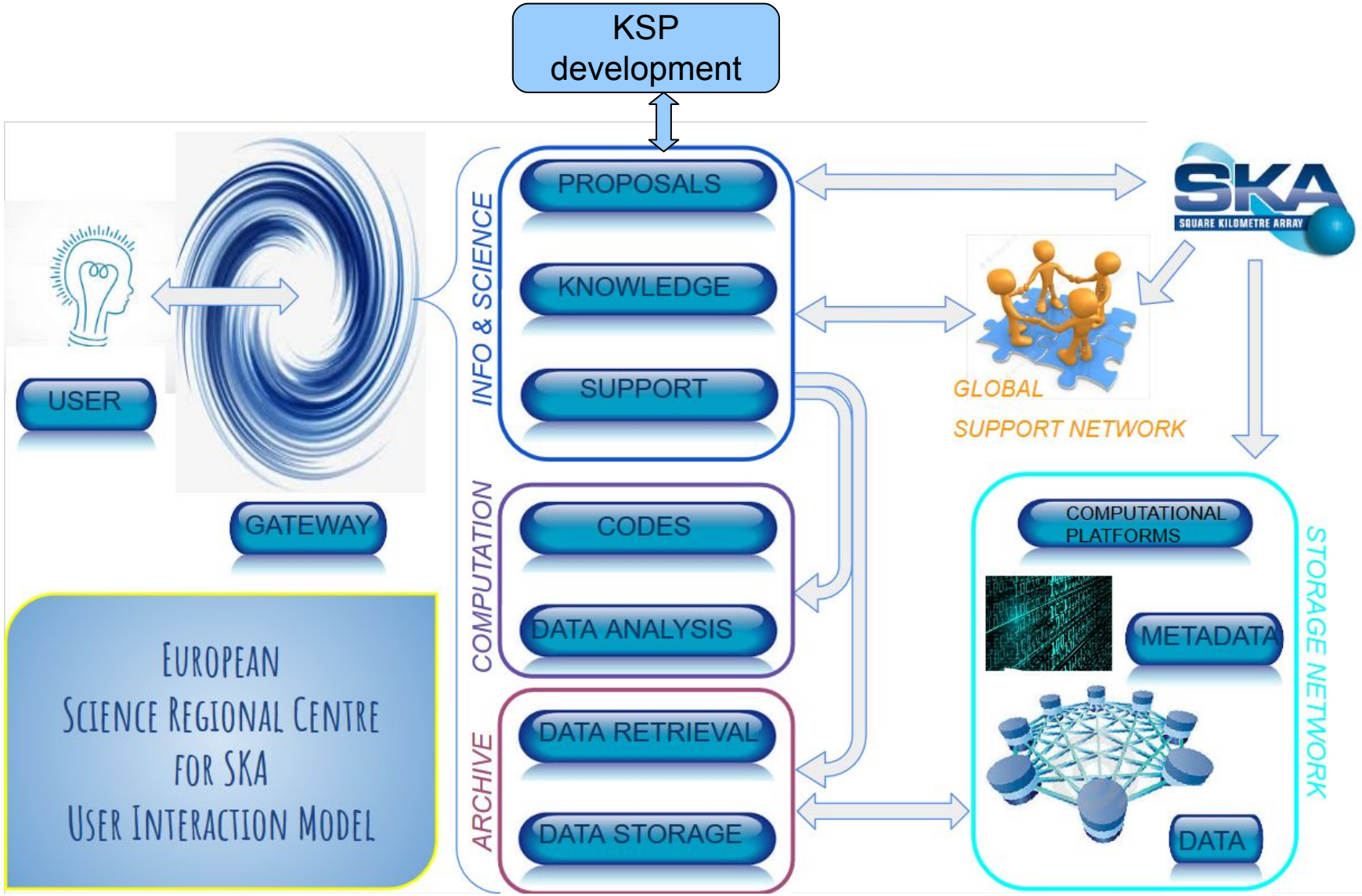
Leads AENEAS WP5

The European Network of Interferometric Centres of Expertise (EU-NICE)

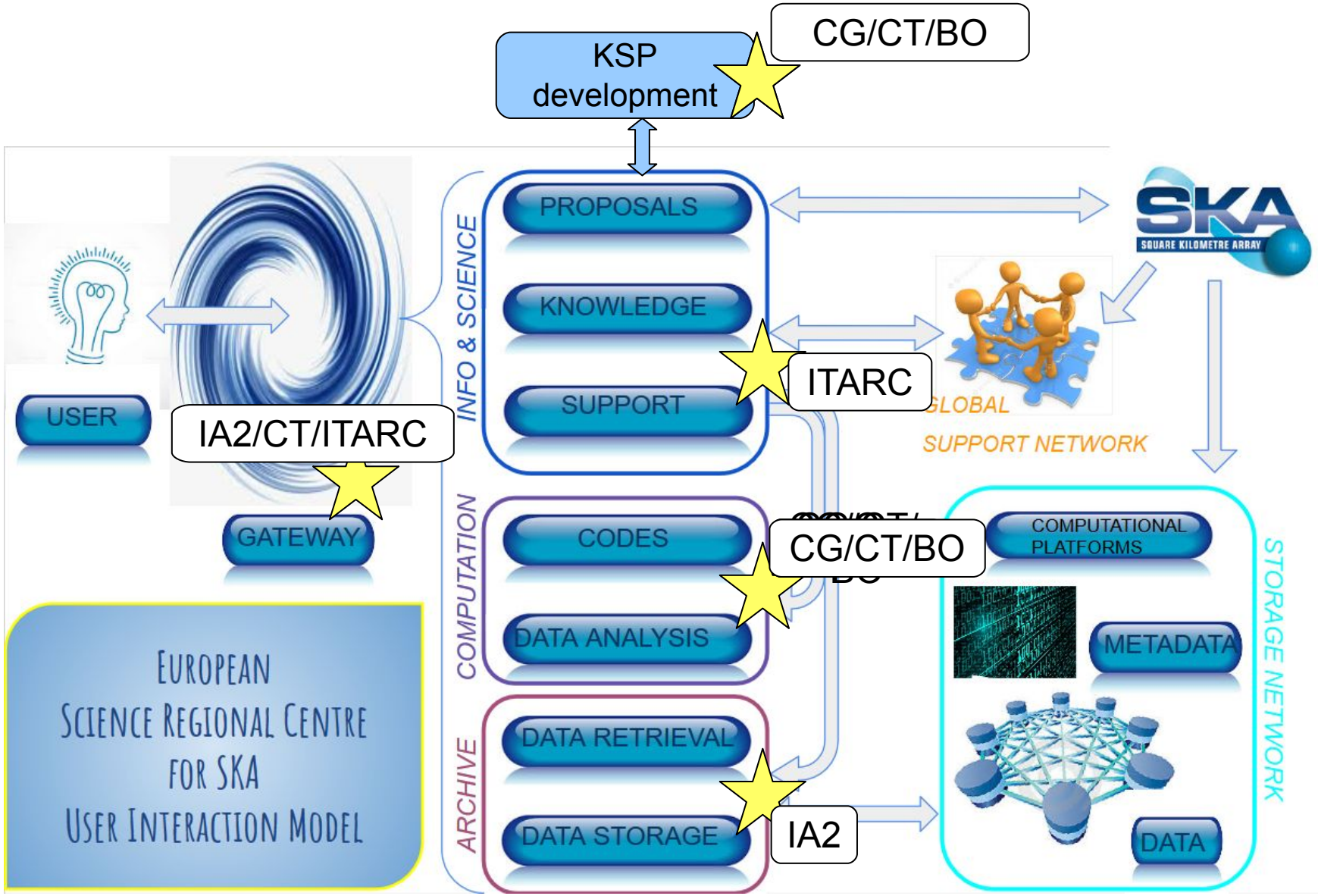
European ARC nodes and other centres of excellence for interferometry are joining into a European NICE:

- Expertise sharing platform
- Multi-wavelength research support through VO and archives
- Support centre for data reduction/analysis of observations taken with other interferometers (JVLA, ATCA, e-MERLIN, VLBI, SMA, NOEMA and next generation telescopes)
- Centre for development of software suitable for many instruments (e.g. KAFE, array combination tools)
- Collaboration platform across disciplines, cross-matching of datasets and linking communities

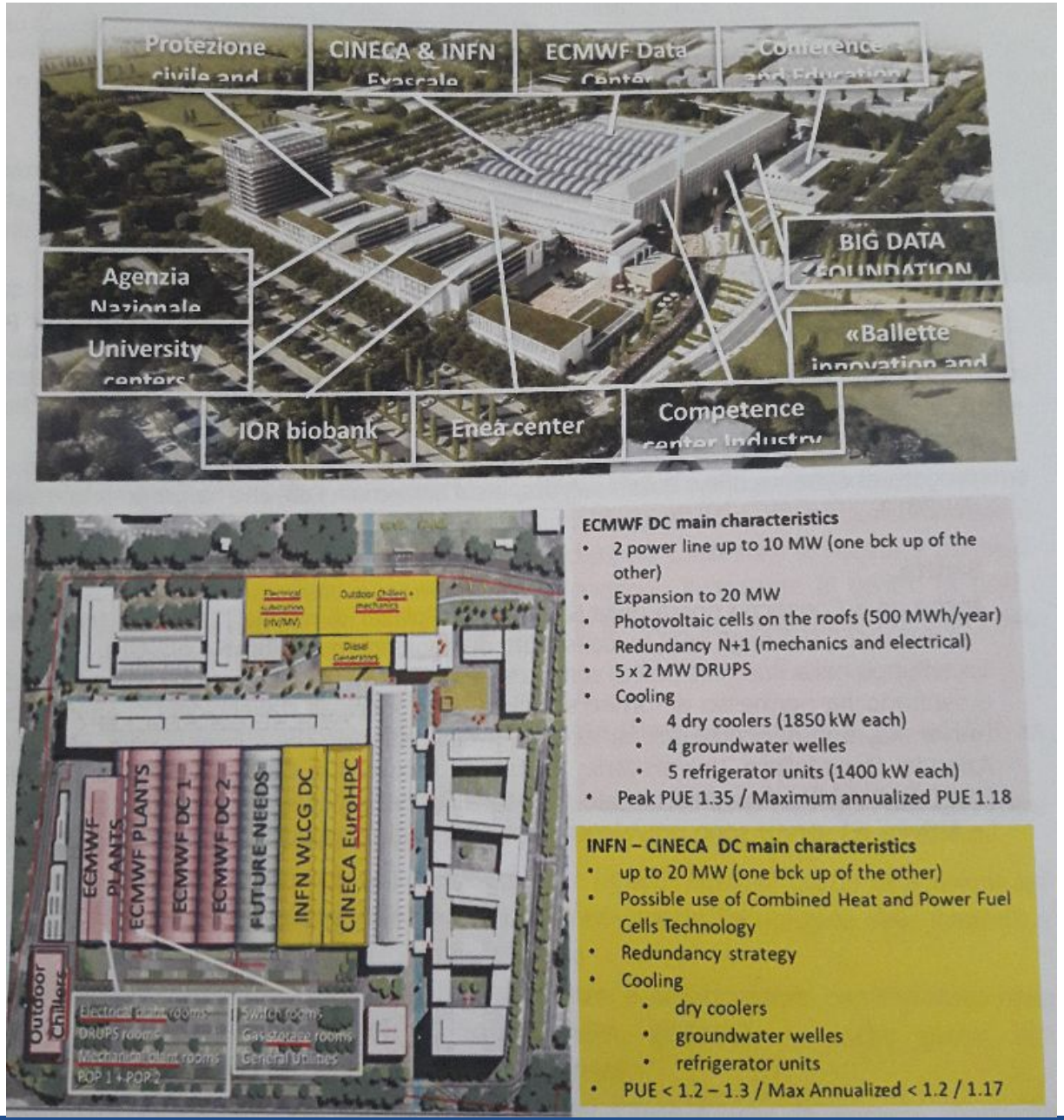
Fitting the SRC design



Fitting the SRC design



...it can become reality!



Tecnopolo in Bologna will host:
- Leonardo 270 PFlops
- ECMWF
- INFN
- CINECA
- INAF

100GB/s GARR backbone network

>100000sqm for research data centers

Operational in 2020

Up to 20 MW power supplies

Shared cooling and power resources

"Thanks to this infrastructure we can candidate as one of the EU SRC for SKA data product analysis" (D'Amico, INAF President@MediaINAF)