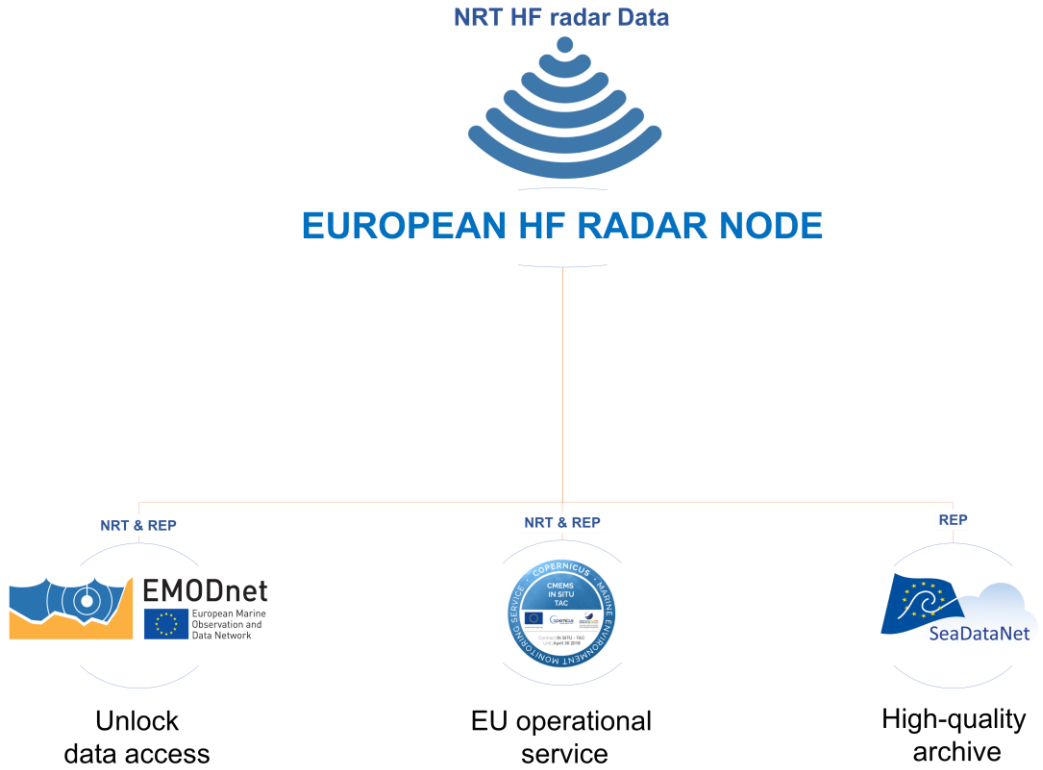
The European HFR Node

from the standard data and QC model to data distribution



L. Corgnati, C. Mantovani, A. Griffa (CNR-ISMAR), J.L. Asensio, A. Rubio, J. Mader (AZTI), E. Reyes (SOCIB), A. Novellino (ETT), P. Gorringe (SMHI)

HFRadar EuroGOOS Task Team

High Frequency Radar technology

- Land-based remote sensing of coastal ocean processes
- High Frequency (HF): from 3 to 30 MHz (wavelength from 10 m to 100 m)
- Provides maps of coastal ocean surface currents
- Wide coverage areas: up to 200 km off the coast
- High spatial and temporal resolutions: typically few kms & hourly

WERA HF radar (source: Elektronik Lab)

Codar HF radar (source: NOAA)

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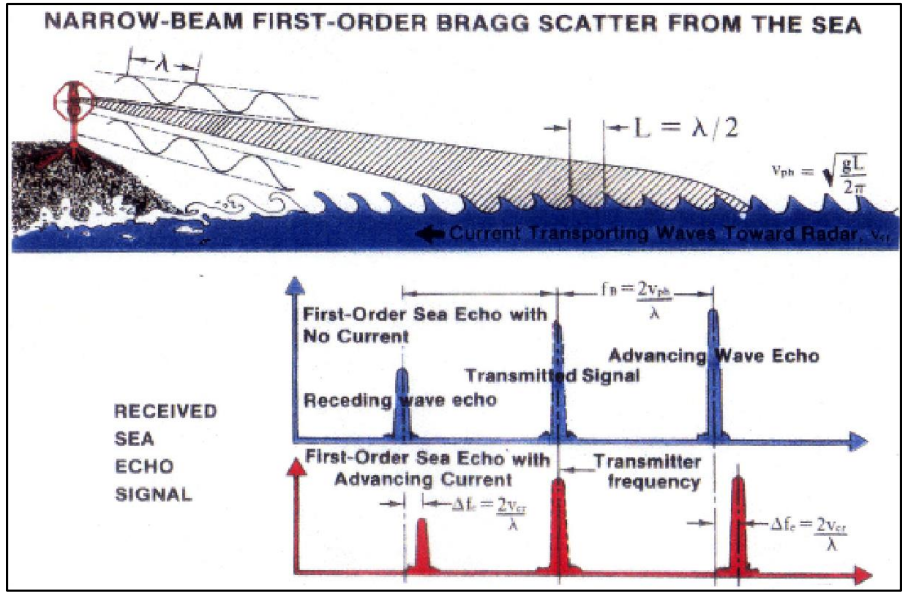
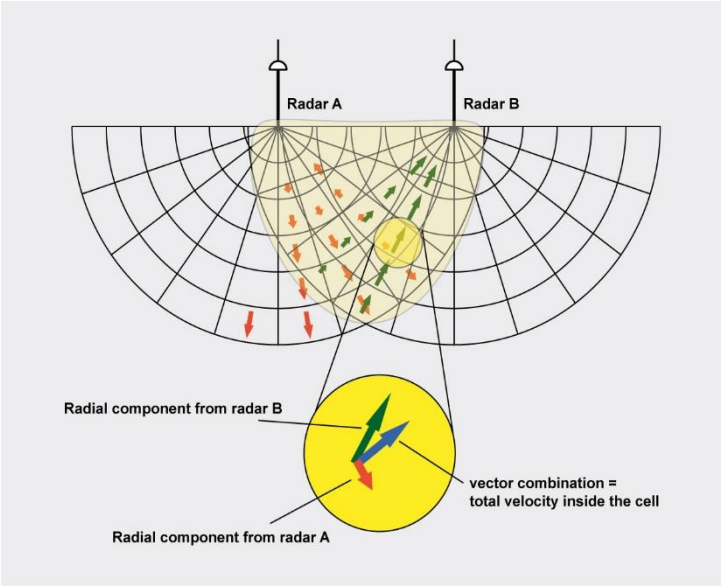


Source: Barrick et al., 1977



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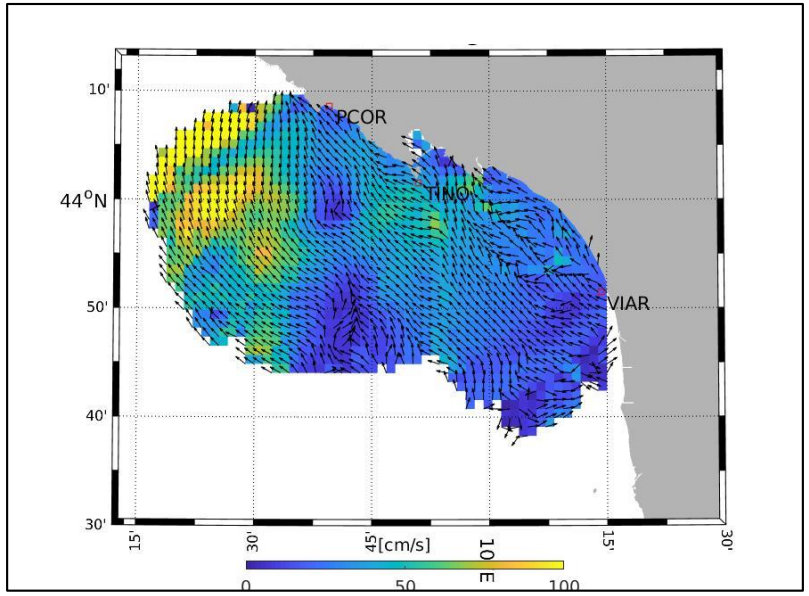
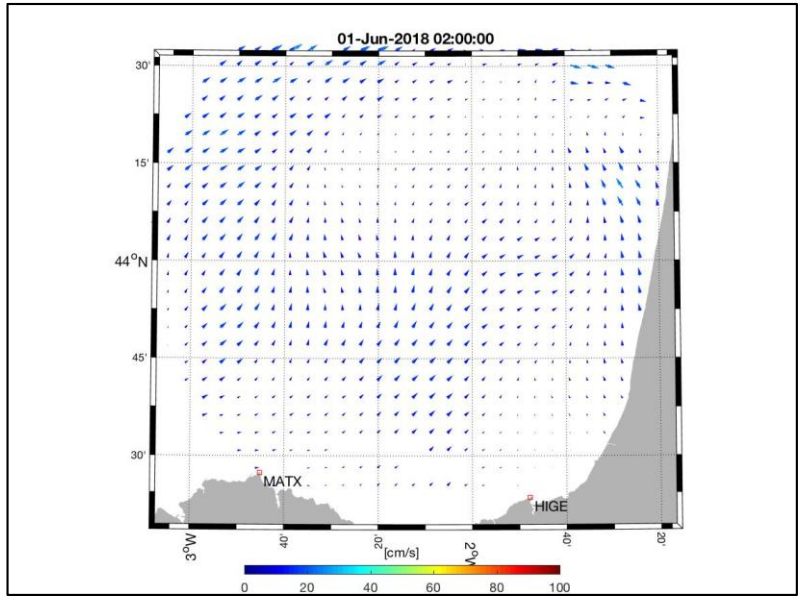


Current field from HFR-TirLig network (Ligurian Sea)



Current field from HFR-EUSKOOS network (Bay of Biscay)

HFRadar EuroGOOS Task Team

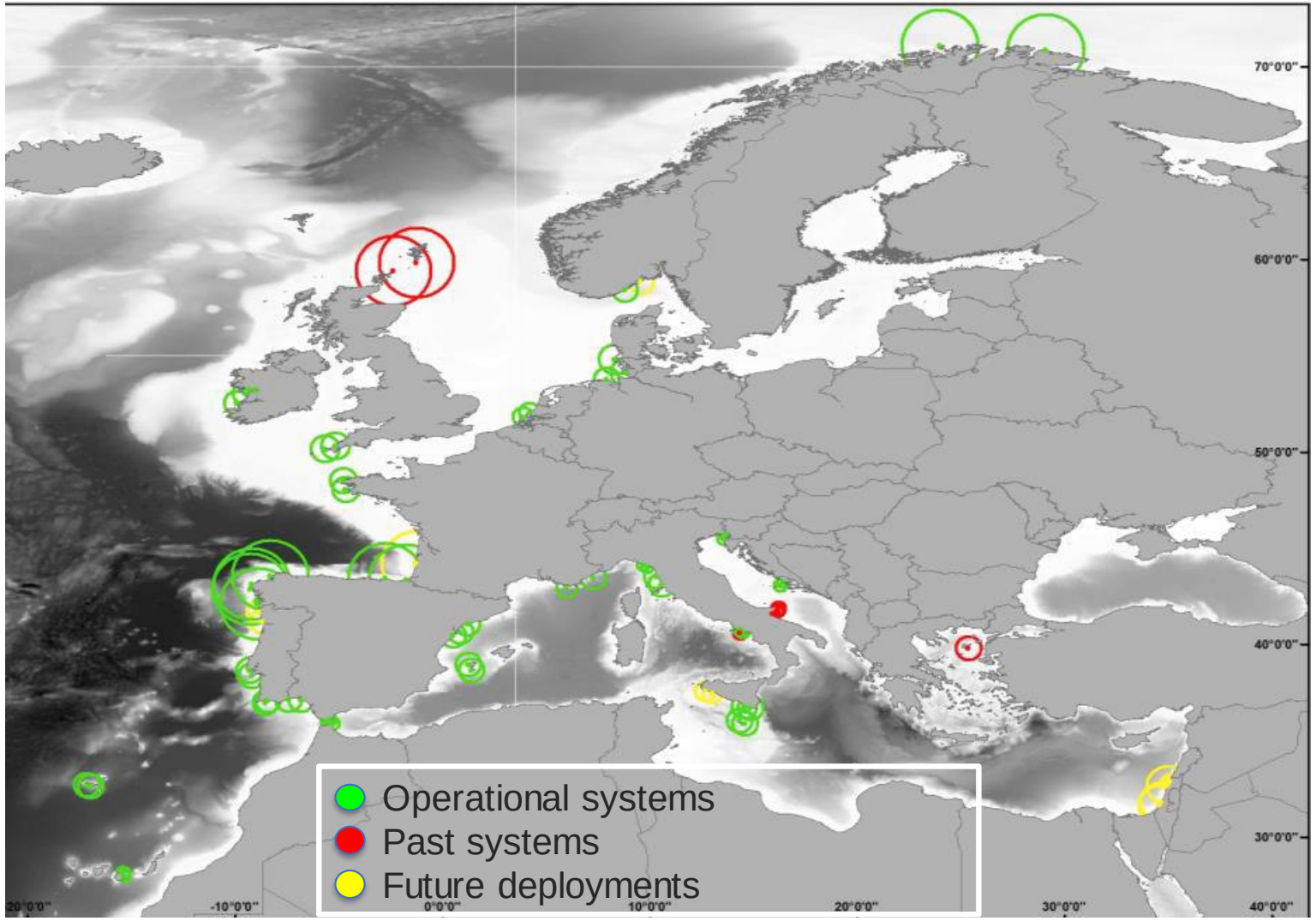
High Frequency Radar applications

- Search and Rescue
- Renewable energy
- Fishery management
- Monitoring of pollutants and biological quantities
- Lagrangian studies and connectivity between marine areas
- Monitoring of ocean processes (currents, waves)
- Ship detection
- Keystone for model assessment
- Coastal ocean model improvements, by Data Assimilation.

Scientific, operational and societal applications need high-quality HF radar data.

Towards a pan-European HFR network

Over 62 HFR sites currently operating and a number in the planning stage.



Growth rate of 7 new systems per year since 2016.

Source: A. Rubio et al., “HF radar activity in European coastal seas: Next steps towards a Pan-European HF radar network,” Frontiers Mar. Sci., vol. 4, pp. 1–8, 2017.

HFRadar EuroGOOS Task Team

Towards a pan-European HFR network

- **Synergy of different initiatives and projects at European level aiming at:**
  - being effective in the **implementation of the coordinated development of coastal High Frequency Radar technology and its products**
  - establishing **the operational HFR European network**.

- **Active initiatives and projects:**
  - **EuroGOOS HFR Task Team**
  - **EMODnet Physics**
  - CMEMS Service Evolution project **INCREASE**
  - EU project **Jerico-Next**
  - EU project **SeaDataCloud**
  - **CMEMS INSTAC Phase 2**

- **Collaboration with: IOOS** (US Integrated Ocean Observing System), **IMOS-ACORN** (Integrated Marine Observing System Australian Coastal Ocean Radar Network), **ROWG** (Radiowave Operators Working Group).

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Inclusion of HFR data into the major European platforms for marine data distribution:

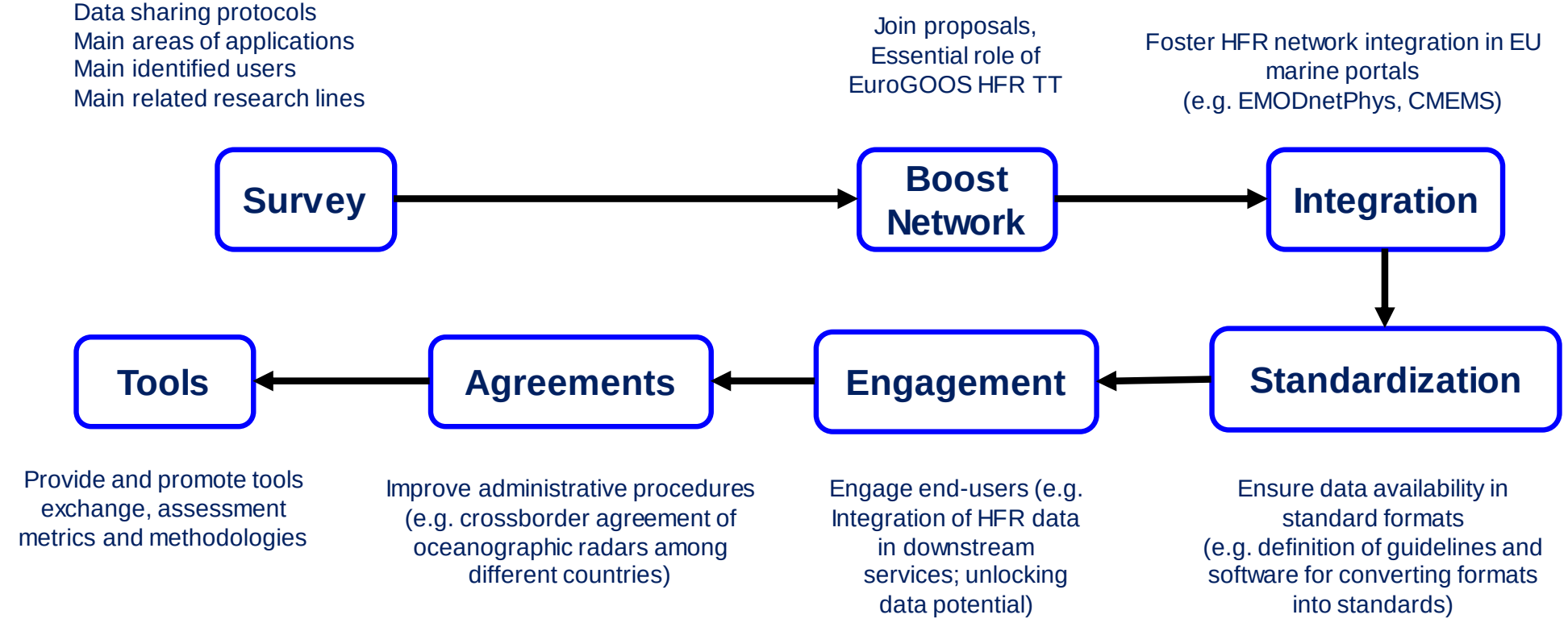
- **CMEMS-INSTAC**
- **SeaDataCloud**
- **EMODnet Physics**

- **Collaboration with: IOOS** (US Integrated Ocean Observing System), **IMOS-ACORN** (Integrated Marine Observing System Australian Coastal Ocean Radar Network), **ROWG** (Radiowave Operators Working Group).

Towards a pan-European HFR network

Launched by EuroGOOS HFR TT to provide:

- General overview of EU HFR system
- Main HFR operation & maintenance issues
- Standardization
- Data sharing protocols
- Main areas of applications
- Main identified users
- Main related research lines



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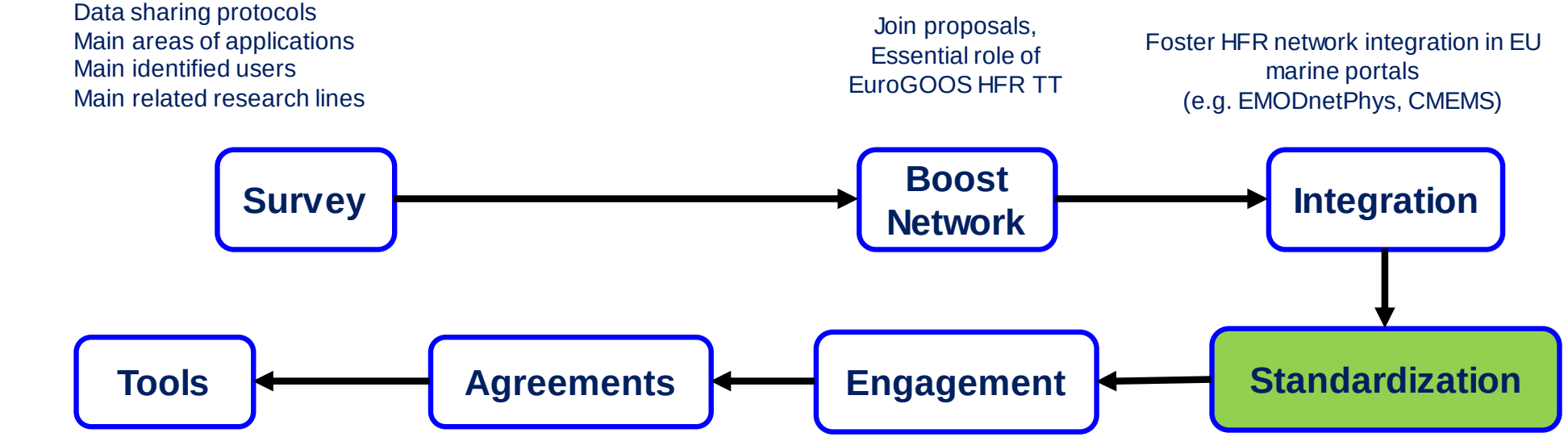

Join proposals, Essential role of EuroGOOS HFR TT

Foster HFR network integration in EU marine portals (e.g. EMODnetPhys, CMEMS)

Ensure data availability in standard formats (e.g. definition of guidelines and software for converting formats into standards)

Engage end-users (e.g. Integration of HFR data in downstream services; unlocking data potential)

Improve administrative procedures (e.g. crossborder agreement of oceanographic radars among different countries)

Provide and promote tools exchange, assessment metrics and methodologies

The standard data, metadata and QC model

- **The purpose of the data model specification is to ensure both efficient and automated HFR data discovery and interoperability, with tools and services across distributed and heterogeneous earth science data systems.**
- **The recommendations for producing HFR data in the European common model have been published in Jerico-Next D5.14 deliverable including SDC compliance, specifying:**
    - File format: *netCDF-4 classic model*
    - Global attribute scheme: mandatory and recommended attributes
    - Dimensions, coordinate variables, data variables and QC variables specification and syntax
    - Quality Control tests and flagging policy

- The data model complies with **CF-1.6, OceanSITES convention, CMEMS-INSTAC requirements, SDC CF extension requirements and INSPIRE directive.**
- The QC model has been defined according to the **DATAMEQ recommendations** and building on the **QARTOD manual (produced by IOOS).**

The EU HFR Node

EuroGOOS ROOSes
ARC, BAL, NWS, IBI, MED

International observation programmes

EU HFR providers

International network of NODCs

HFR NRT data

HFR REP data

EU HFR Node

azti tecnalia · CNR Consiglio Nazionale delle Ricerche · ISMAR Istituto di Scienze Marine · SOCIB

EU focal point with:

- Data providers
- Key EU networking infrastructures
- Global HF Radar network

Key roles:

- Connection with **data providers** for NRT and REP data
- Connection with **CMEMS-INSTAC** for NRT and REP data
- Connection with **SeaDataNet** for REP data
- Ensure optimal **visibility** of HF radar data
- Foster the **application** of HF radar data
- Produce HF radar data **advanced products**

NRT & REP → EMODnet European Marine Observation and Data Network

NRT & REP → COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE · CMEMS IN SITU TAC · Contract IN SITU - TAC Until April 30 2018

REP → SeaDataNet

The EU HFR Node

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International observation programmes

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Data Centre: - link with data providers
- collect & archive HF radar data

Software tools: for HF radar data standardization

Data processing and catalogue creation

NRT & REP

EMODnet European Marine Observation and Data Network

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REP

SeaDataNet

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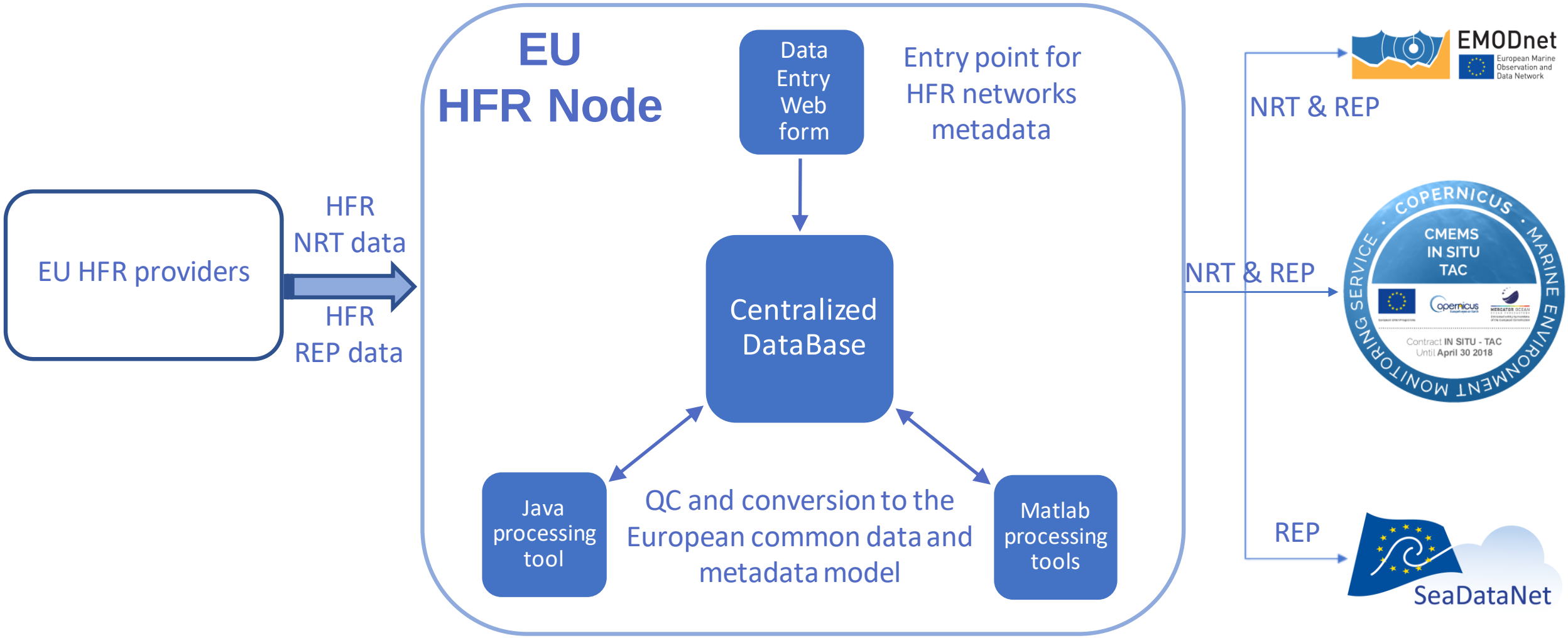

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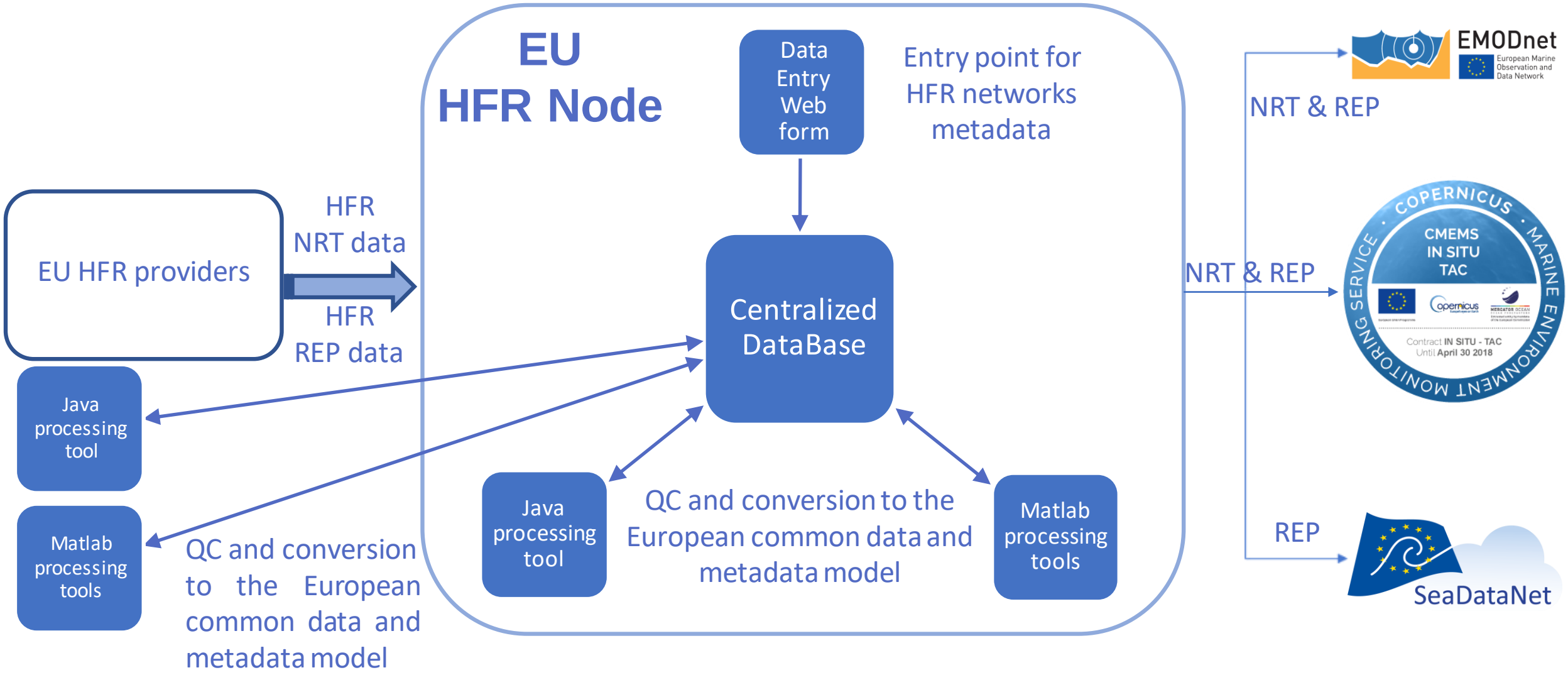

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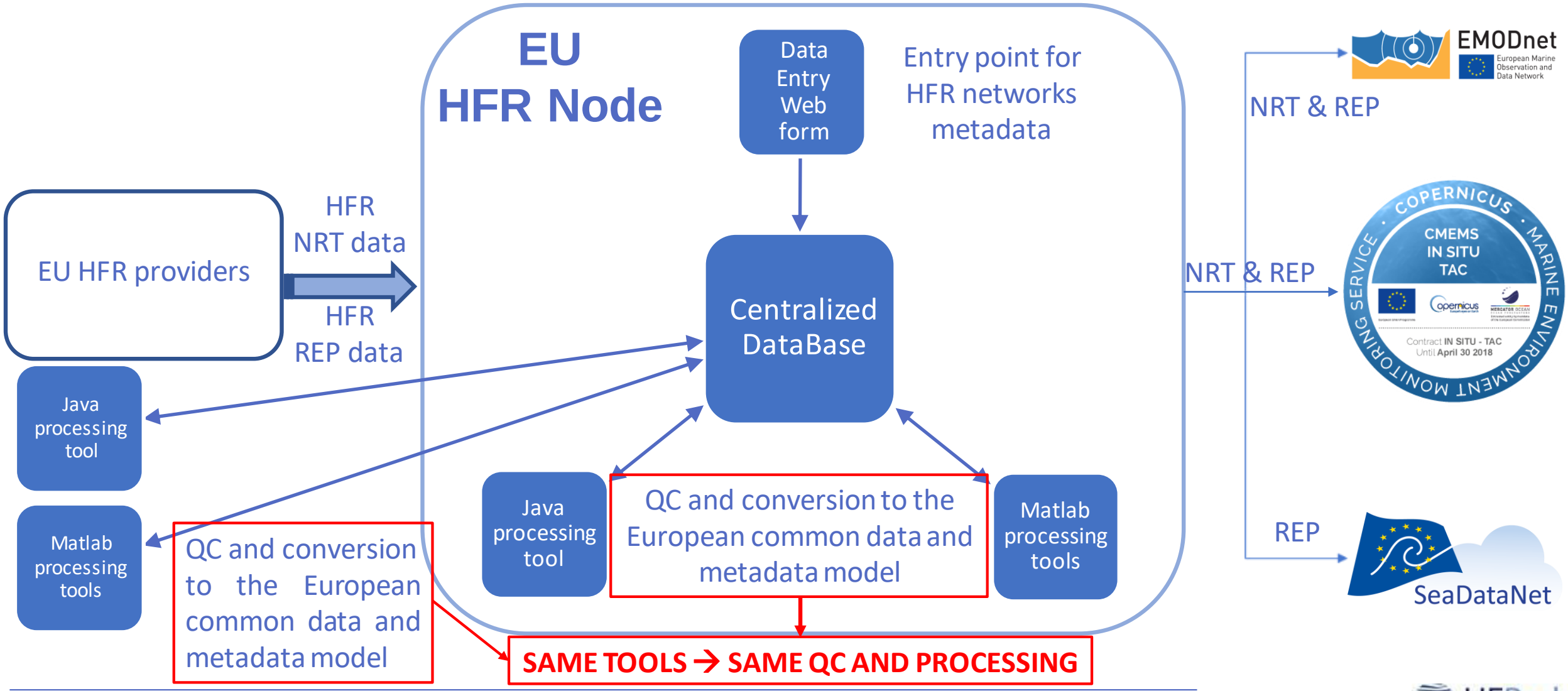

HFRadar
EuroGOOS Task Team

Useful links

- **Documentation:** https://drive.google.com/drive/folders/19pxHrpFiEyNZC6Wl69gHFR4P1Jw8CJvu
- **The data model reference card:** http://www.marineinsitu.eu/wp-content/uploads/2018/02/HFR_Data_Model_Reference_Card_v1.pdf
- **The EU HFR Node data entry WebForm:** http://150.145.136.36
- **The software tool repository:**
  - **Matlab tools:** https://github.com/LorenzoCorgnati/HFR_Node_tools
  - **Java tools:** https://github.com/llasensio/JRadar
- **SDN Metadata services:** https://www.seadatanet.org/Metadata
- **Contacts:** euhfrnode@azti.es

Thanks for your attention