ESCAPE

European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

CASA

JIVE

E-OSSR Onboarding Presentation

27 November 2020

ESCAPE - The European Science Cluster of Astronomy & Particle Physics ESFRI Research Infrastructures has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n° 824064.

JIVE

- Joint Instutute for VLBI ERIC
  - Support the European VLBI Network (EVN)
  - To do very high resolution radio astronomy (mas)

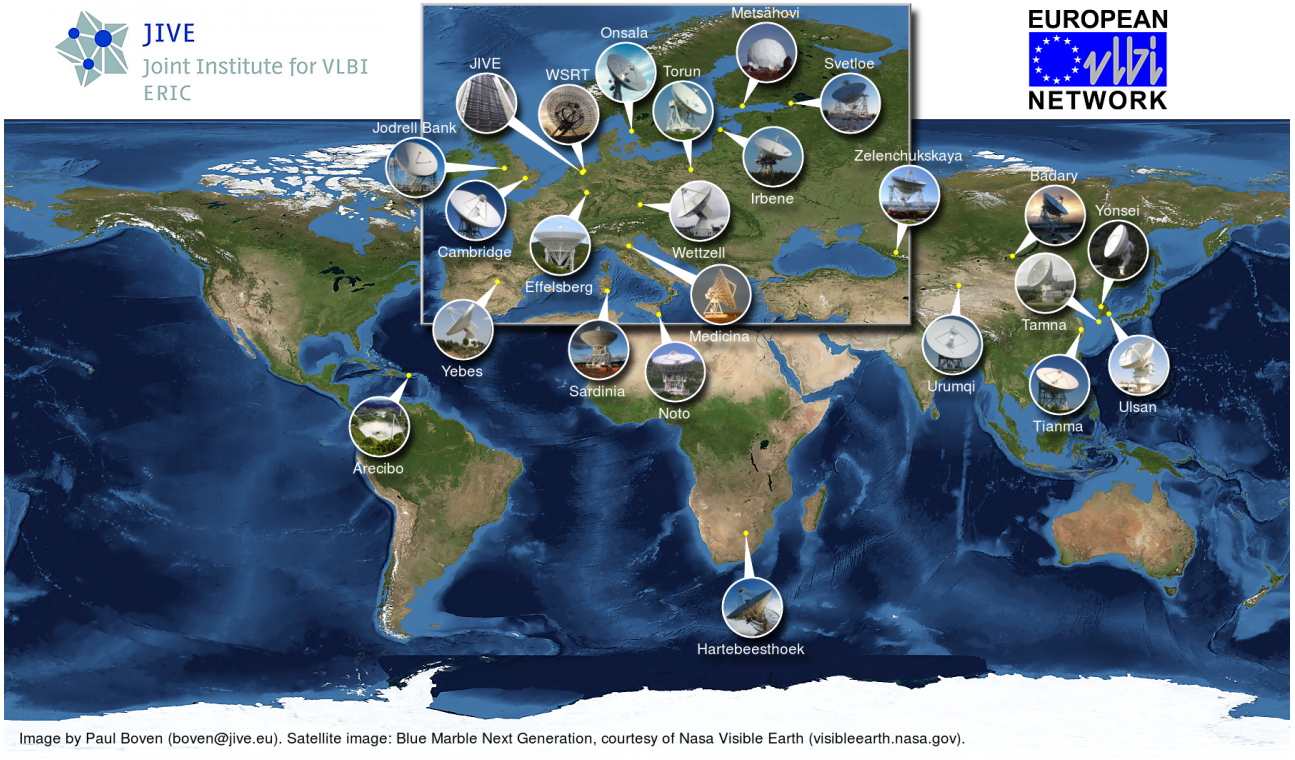

Image by Paul Boven (boven@jive.eu). Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).

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CASA

- Common Astronomy Software Applications
  - Based on casacore libraries
  - Official package for ALMA and VLA
  - Used by other telescopes (MeerKAT, ATCA)
- VLBI
  - Replacing current AIPS-based data reduction
    - AIPS: old non-standard FORTRAN code no longer supported by NRAO
  - Calibration and imaging of visibility data
  - Used by scientist and (future) QA pipeline
    - Provide pipeline notebooks as starting point

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CASA Python transition

- Currently two main CASA versions
  - CASA 5: monolythic, Python 2 based
  - CASA 6: modular, Python 3 based
    - Also available as PIP wheels
- MeasurementSet data model
  - Used by most modern radio instruments (LOFAR, ASKAP)
- CASA tables data format

- Future development: CNGI
  - Based on dask/xarray
  - https://cngi-prototype.readthedocs.io/

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CASA development

- Developed by an international consortium lead by NRAO
- Development driven by stakeholder requirements
- C++ and Python
- Developed using Atlassian suite (JIRA, Bitbucket, Bamboo)
  - Development on git branches associated with JIRA tickets
- Online documentation in Plone
  - Documentation of new features strictly enforced
- Extensive test-suite that uses CI (Bamboo)
  - Delivers packages used for **verification** and **validation**
- Semantic versioning
  - Typically two releases per year + “pipeline” releases
- Software primarily operates on Measurement Sets
- Licensed under LGPL-3.0 and GPL-3.0

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CASA Requirements

- Supported on Mac OS X and Linux (RHEL)
  - Typically supports last two OS X releases
  - RHEL package runs on most Linux distros
  - Linux package delivered as tar file that includes deps
- Medium configuration: 8 core CPU, 128GB memory, 24 TB of storage
- JIVE provides containerized CASA Jupyter kernel
  - Build from source on Ubuntu
- Container includes some additional tools: AOFlagger, WSclean, jplotter
  - All Operate on Measurement Sets

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OSSR Integration

- Onboarding
  - Jupyter kernel source code
  - DOCKER and Singularity containers
- Source code and Jupyter kernel documentation
  - https://github.com/aardk/jupyter-casa
  - https://gitlab.in2p3.fr/keimpema/jupyter-casa
- Tutorials: https://casaguides.nrao.edu
- Data discovery
  - Virtual Observatory (VO) mostly centred on providing images, not raw data
  - VO TAP service for EVN Archive is under development (WP4)

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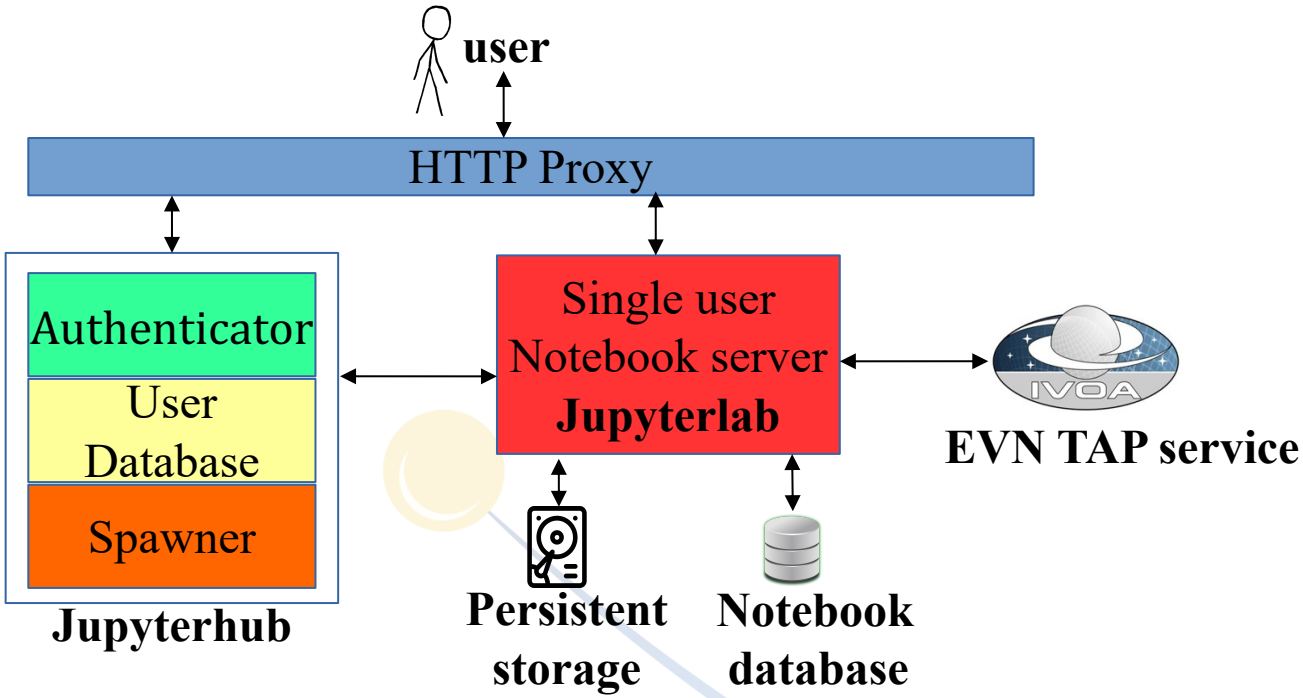
Use Case: EVN Archive

- Provide access to EVN Archive through Jupyterhub
- Users can pipeline any experiment and results are stored in persistent storage
- Will be made available in the ESAP



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EVN JupyterHub demo

vla-cont-tutorial

localhost:8889/notebooks/data/vla-cont-tutorial.ipynb

jupyter vla-cont-tutorial Last Checkpoint: an hour ago (autosaved)

Logout

File Edit View Insert Cell Kernel Widgets Help

Trusted Casa

Run Code

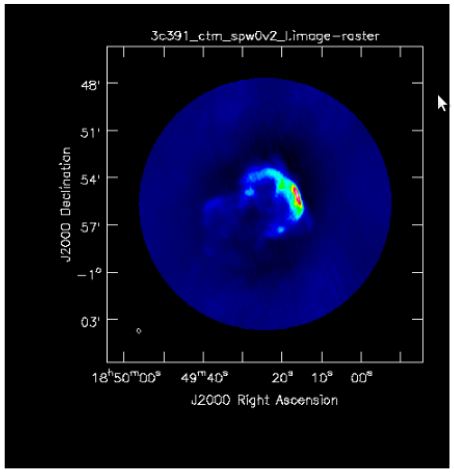
In [3]:
```
clearstat()
tclean(vis='3c391_ctm_mosaic_spw0.ms',imagename='3c391_ctm_spw0_multiscale_selfcal1',
      field='',spw='',
      specmode='mfs',
      niter=20000,
      gain=0.1,threshold='1mJy',
      gridder='mosaic',
      deconvolver='multiscale',
      scales=[0, 5, 15, 45],smallscalebias=0.9,
      interactive=False,
      imsize=[480,480],cell=['2.5arcsec','2.5arcsec'],
      stokes='I',
      weighting='briggs',robust=0.5,
      pbcor=False,
      savemodel='modelcolumn')
```

Out[3]: {}

Show log

We can open the **viewer** to see the result of the imaging.

In [4]:
```
viewer('3c391_ctm_spw0v2_I.image')
```



Show log

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