Technical Operations and R&D at JIVE

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What do we do?

- Correlators
  - More capacity, new telescopes, development of AVN, new features
- Data recording/playback/transport
  - Real time/near-real time, higher bandwidths, 2 and 4Gbps
- Automated operations
  - Get rid of disk shipping
  - Monitoring, automated fringe checking
  - Triggered observations
- SKA and mm VLBI
  - **User software**, VLBI with CASA
  - SAT architect in SaDT consortium
  - Simulations for BHC
  - Fringe checking
- Time and frequency transfer

- New project: Jumping JIVE

JIVE R&D

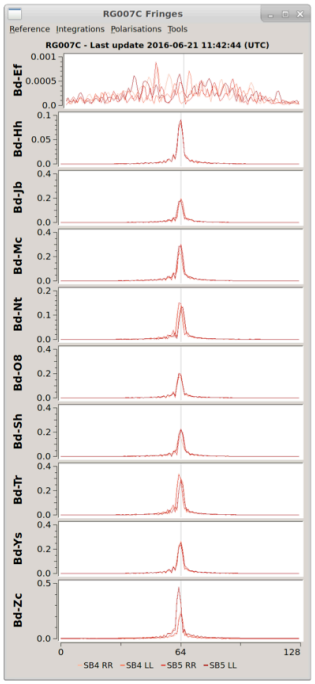
- Continued development of Jive5AB
  - Transparently read to and from Mark6 or FlexBuff in either format
  - Increasing internal timing accuracy to deal with future high data rates
  - Enabling the resumption of interrupted transfers
  - Error/success detection capability
  - Talk by Harro Verkouter

- FlexBuff recording fully operational
  - New machines received from Hart, Effelsberg, Yebes
  - Testing new type of 8TB disks
  - Westerbork (still) considering purchase

More…

- 2Gbps e-VLBI tested, declared operational
  - Needs direct control of Fila10G
  - Proxy developed to combine both FS and correlator commands into one stream
  - Great care taken to make system secure, no direct access to FS from outside

- 2 KVAZAR stations join in during e-VLBI test time in June
  - 512 Mbps (for now)
  - More to come?
  - 17 Gbps into JIVE
  - Picture of the day!

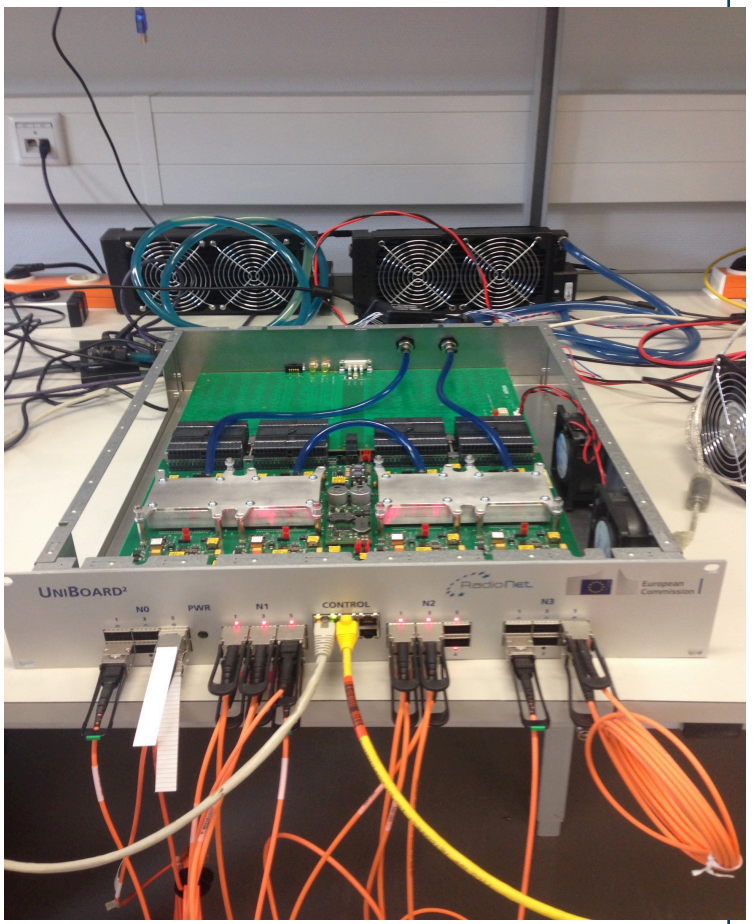


More…

- 4Gbps VLBI coming along
  - Needs PFB mode of DBBC
  - Large effort by Himwich, assisted by Quick, Bach, Campbell, Tuccari, de Vicentes….. and many others
  - Tested recently, but issues remain
- Backup mirror machine in Westerbork re-vamped
  - Used to be used by both JIVE and ASTRON, was in a bit of a state
- Backup machine in Dwingeloo to be expanded before end of year
  - Currently ~60TB
- Talks with Bonn about including all future experiments in central EVN archive

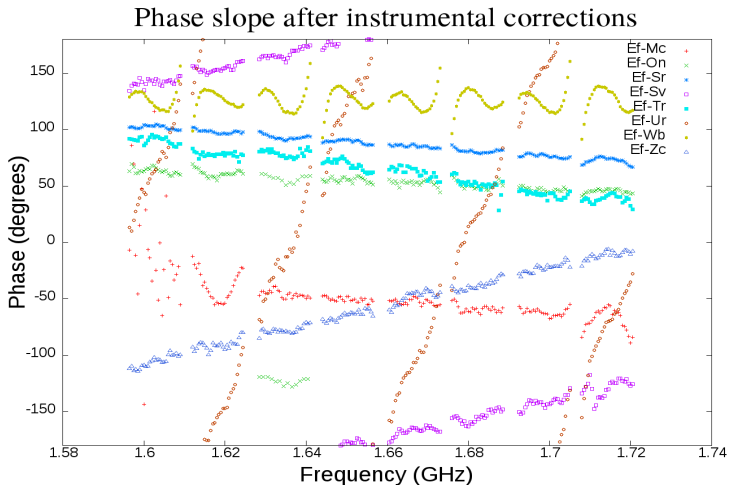
JUC & UniBoard2

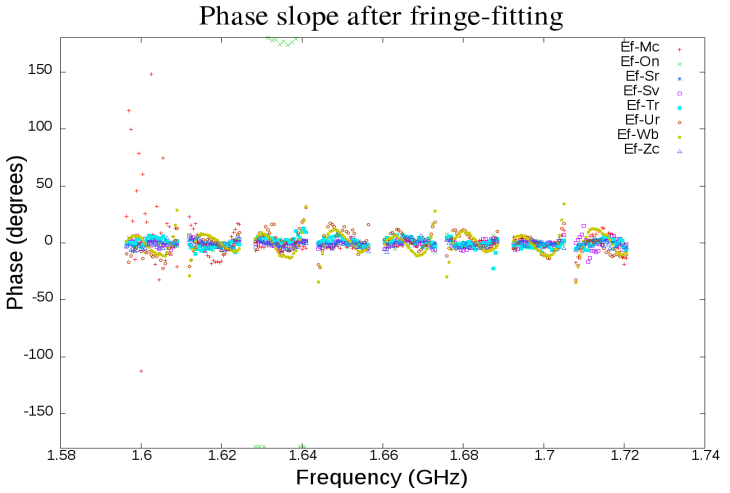
- Boards arrived in December 2015
  - Much testing
    - Exploding capacitors replaced by non-exploding type
  - Boards shipped to participants
  - Will be used for Apertif
    - But not SKA….
- JUC coming along nicely
  - Focus on operator-friendly control system
  - Run regular correlator jobs from disk packs
  - Fringe and Weight display implemented
  - Will test both 16 and 32 MHz personalities during next e-VLBI run
  - Perfect geo correlator?



R&D User software development

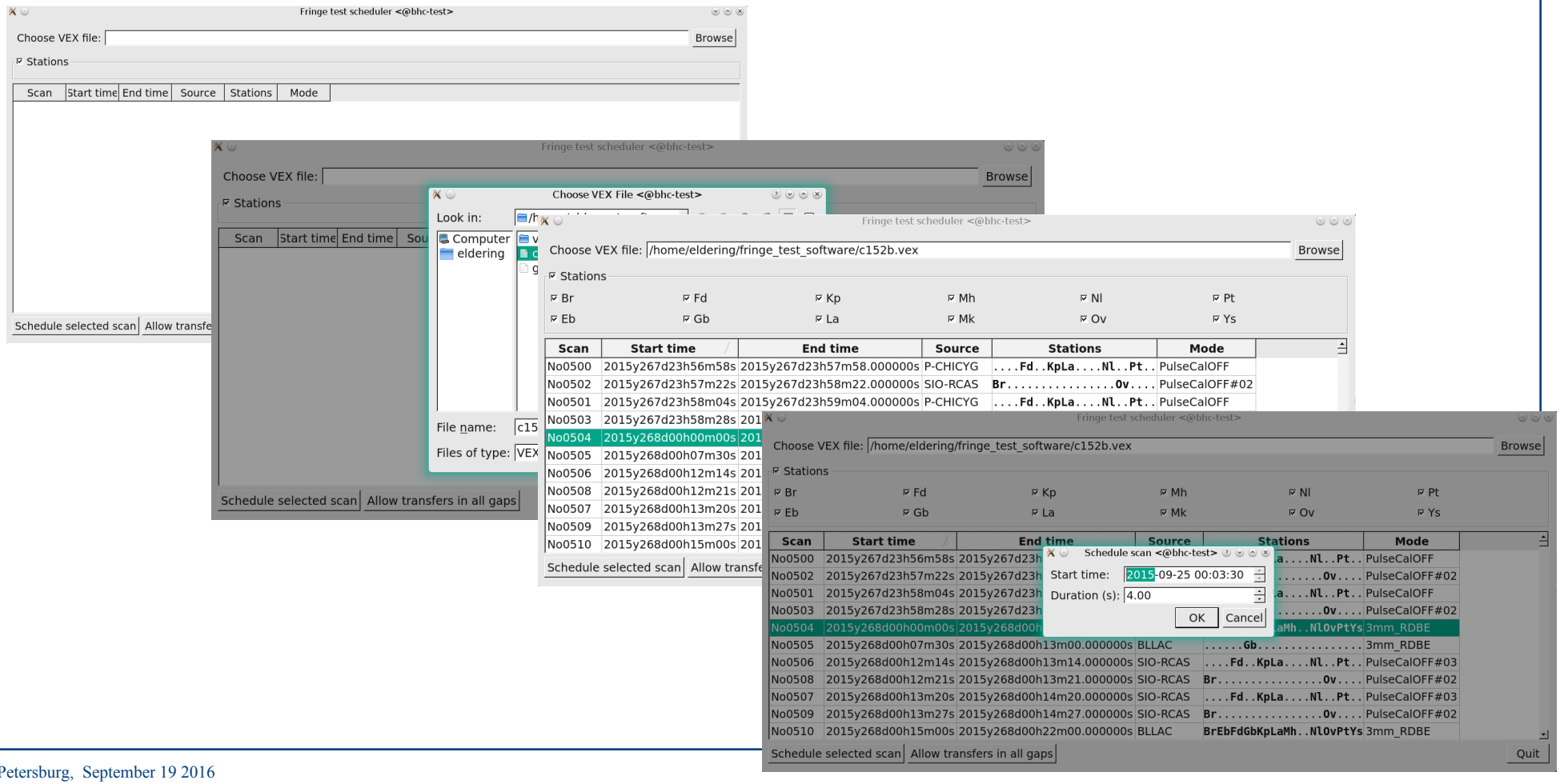
- BlackHoleCam and SKA-NL: combining efforts
  - AIPS fringe fitting functionality in CASA, validated
    - However, will need to be re-written in C++
  - End to end VLBI data reduction of CASA discussed with NRAO
- Drafting MOU with NRAO regarding development and maintenance of VLBI support in CASA
- Continued support for ParselTongue
- OBELICS work package in ASTERICS
  - Picks up HILADO work where it left off
  - Minimize re-calculation when changing parameters during data reduction of large data sets
  - Go from prototype to production
  - CASA in Jupyter





mm-VLBI fringe checking

- Based on experiment schedule
- Select scans, gaps for transfer



Correlation

- SFXC software correlator at JIVE:

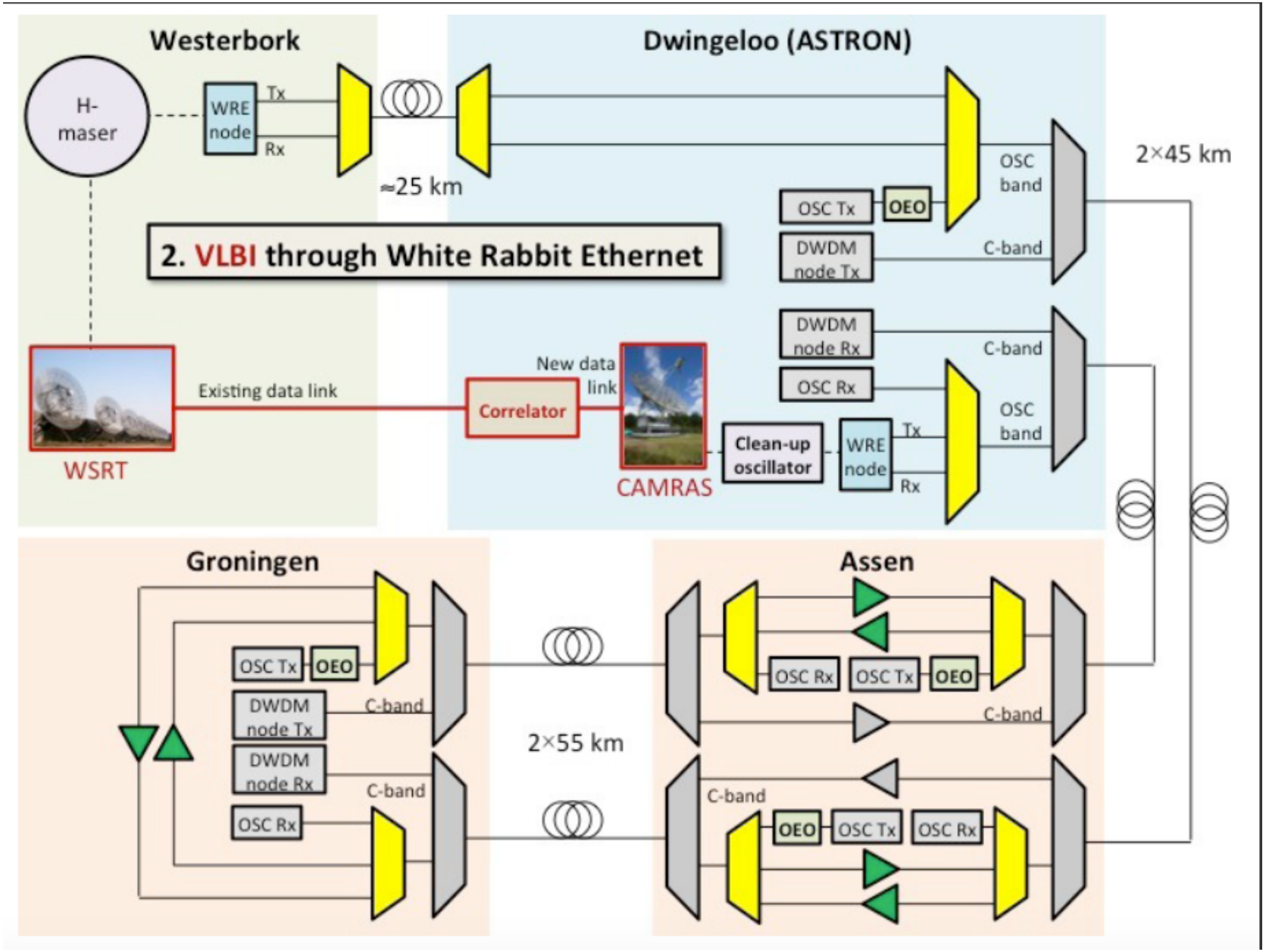
- 50 nodes; 524 cores
  (Intel Xeon 5500/5600/E5-2600/E5-2630)
- QDR Infiniband interconnect
  (40 Mbit/s)
- 16 nodes with 10 GbE
  (currently limited to 30 Gbit/s total)
- 18 stations @1Gbit/s real-time
  (with cross-polarisations, estimated)

- Still waiting for many beam shapes!!

WP5 - CLEOPATRA: Connecting Locations of ESFRI Observatories and Partners in Astronomy for Timing and Real-time Alerts

- Led by JIVE
- Time and frequency transfer
- relaying alerts (warning system for transient events, also in EVN)
- data streaming software (builds on Jive5ab experience)
- advanced scheduling algorithms for complex, large arrays (mainly for SKA, CTA)

Frequency transfer demo in CLEOPATRA



What is White Rabbit?

- Sub-ns accurate synchronization network
- Open Hardware design, project started at CERN
- Based on:
  - PTP (IEEE1588v2)
  - Bidirectional (BiDi) SFPs
  - SyncE: Syntonization of 125 MHz clock
  - 1 Gb/s Ethernet
- In use in several accelerators and astronomy instruments around the world

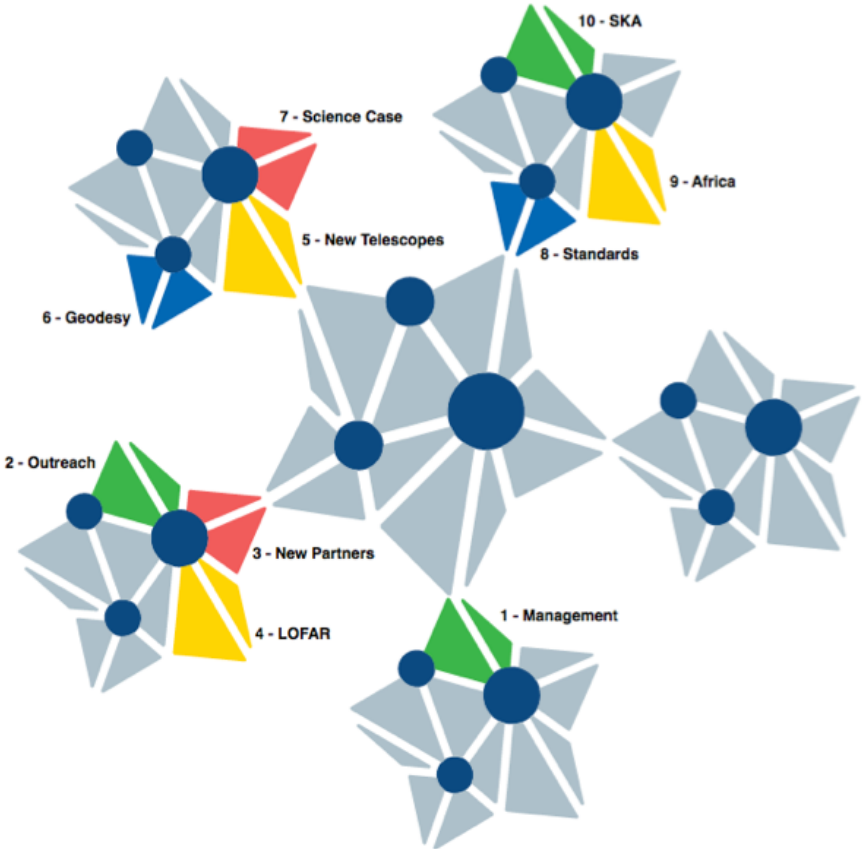
KAT7 VLBI

- KAT7: prototype array for MeerKAT
- Functional, and available
- Very similar to MeerKAT in many ways

- VLBI working group, chaired by Roger Deane
- Write white paper, position VLBI for MeerKAT
  - And later, SKA
- Do VLBI demo with number of EVN stations
  - This week after e-session
  - Both phased and single dish
- eBob currently in Cape Town
  - Working on converting beam-formed data to VDIF
  - First off-line, but on-the-fly needed for real-time
  - Already implemented on GPU machines

JUMPING JIVE I

- Call INFRADEV-3-2016
  - Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE
  - Call for profiling excellent Research Infrastructures
    - Enlarging its User Participation
    - Preparing for Globalisation
- Profiling JIVE ERIC
  - strengthen JIVE, advocate its services and enlarge its partnerships, in preparation for global VLBI in the SKA era
- Implemented as distributed effort
  - JIVE eligible to do this as ERIC



JUMPING JIVE II

wp	partners	implementation
Management	JIVE	support management assistant
Outreach	JIVE, IGN, SKAO	0.5 outreach officer
New Partnerships	JIVE	0.5 policy officer
ERIC also for LOFAR	ASTRON, JIVE, ILT	policy officer, ILT management
Integrating new elements	IGN, JIVE	Tiger team, support scientist
Geodesy	CNRS/BORD, JIVE	Correlator support, postdoc
The VLBI future	INAF, JIVE, OSO	Development EVN science case
Global VLBI Interfaces	JIVE, OSO, TUM	Sched and remote telescope support
Capacity in Africa	UMAN, JIVE, DST, Leeds	Exchange programmes
VLBI with SKA	JIVE, SKAO	Liaison officers, VLBI WG support