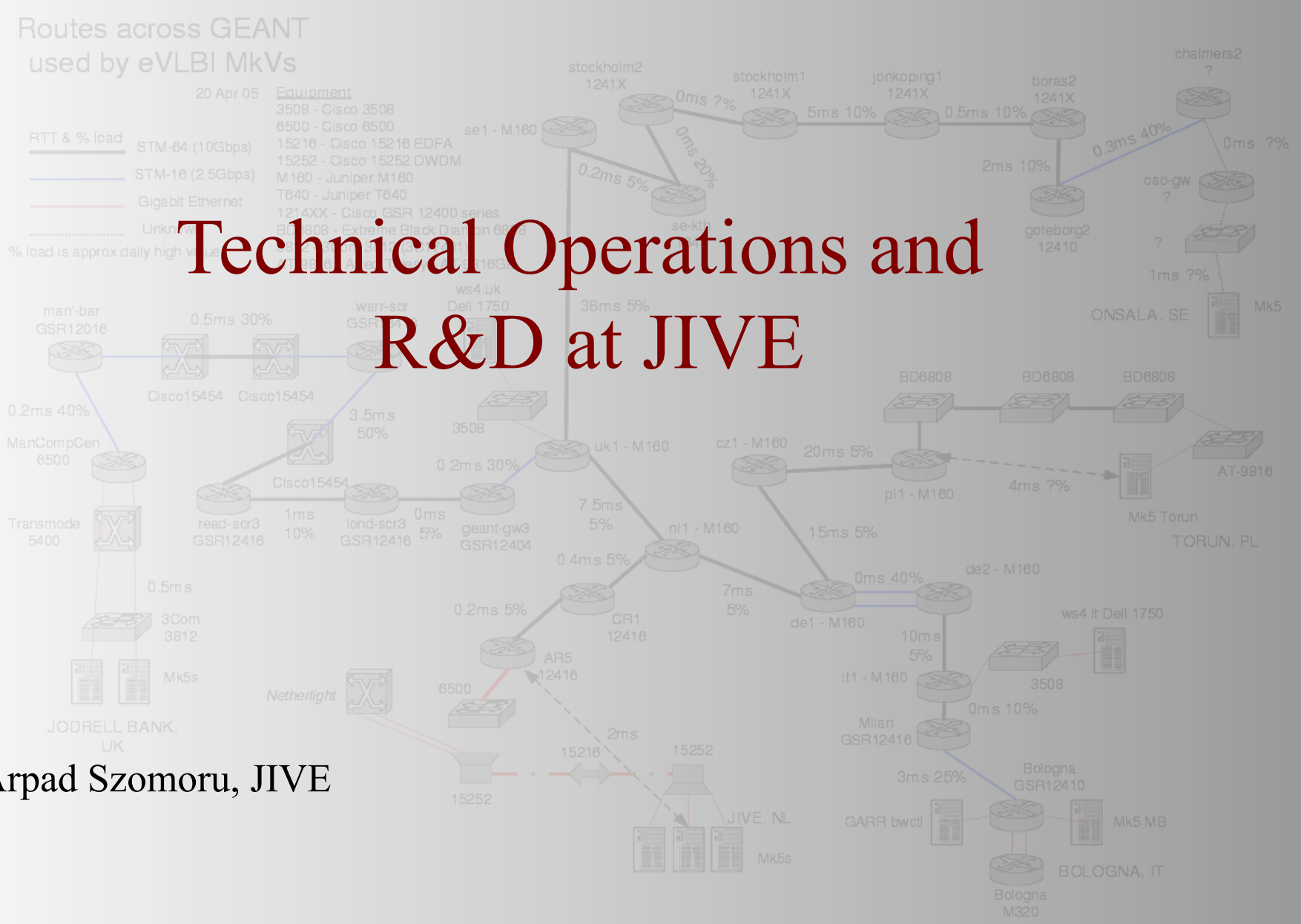


Technical Operations and R&D at JIVE

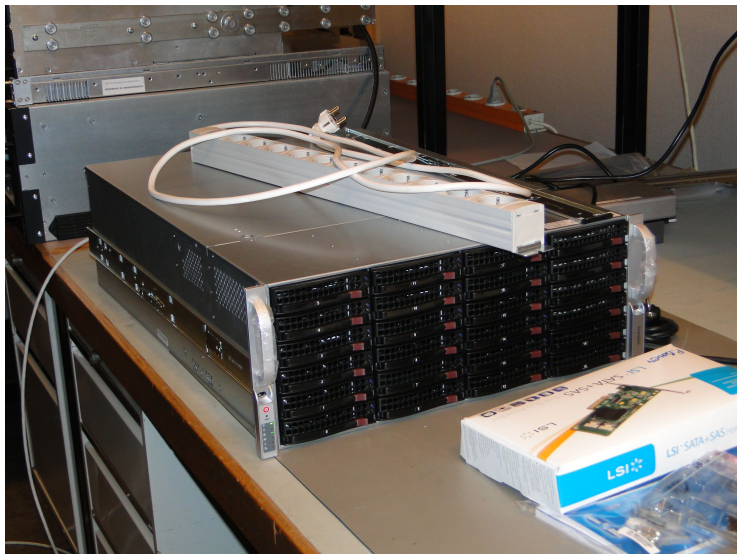
Arpad Szomoru, JIVE

Mark5, SUs, MarkIV correlator

- Mark5, general
  - Decision on Sdk 9 *still* (!!!) needed
- Mark5B/C
  - 2 units permanently converted to B
  - 1 extra unit currently B+, 6 C units in place
  - 1 C unit on loan to Yebes
- SU
  - Functioning…
    - Although we'd rather not turn them off…
- MkIV Correlator
  - Now only used for e-VLBI
  - Definitely should not be turned off

Mark5B/B+, Jive5AB, Archive

- Native Mark5B, e-based:
  - Given up, Mark5B could never have been used at correlator
  - Which by now is completely irrelevant anyway
- Jive5AB control code re-written (ongoing)
  - Simultaneous recording/real-time streaming sorted
  - Runs on different platforms
  - Complete control functionality is being implemented
- Archive machine replaced
  - 40 TB (?)
  - In the nick of time
  - Also this machine works to Dr. Bob's satisfaction (!!)



e-status

- Full 1024 Mbps used operationally, from most stations
  - e with dBBC working fine from Ef
- Channel dropping available when needed
- Sh still limited to 256 Mbps
  - Congestion within China
  - No improvement in sight
- Ar at 512 Mbps, Hh, Yb, Mc at a full 1024 Mbps, Nt back in business!
- EVN-ASKAP e-test still in planning
- First attempts to bring e-Merlin back into array
- Should aim towards 3 stations at 1 Gbps, both recorded and real-time
  - As first step
  - VDIF output, problem for MarkIV
  - SFXC not (yet) enough capacity for 12-station correlation
  - Reverse corner turning needed?
  - Issues with recording needs to be addressed (AriBoxes?)

SFXC Correlator

SFXC: New Features (JIVE)

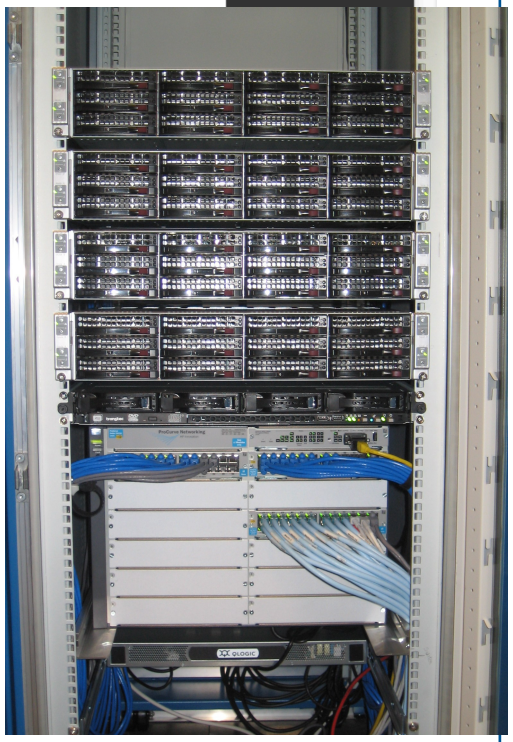
- Multiple phase centers
  - Use high time/spectral resolution internally to prevent smearing
  - Apply phase shift for each center
  - Average down to desired time/spectral resolution
- WOLA
  - Windowing functions: Rectangular, Hann, Hamming, Cosine

    Adding other functions is trivial
- Space Science features
  - Improved delay tracking for high spectral resolution
  - Near-field model (Dmitry Duev)
  - Possibility to include Doppler-shift in model
- Operational tools
  - weight display, fringe display, clock search tool

Correlation shifting from Mark 4 correlator to SFXC
  - All disk-based VLBI correlated on SFXC

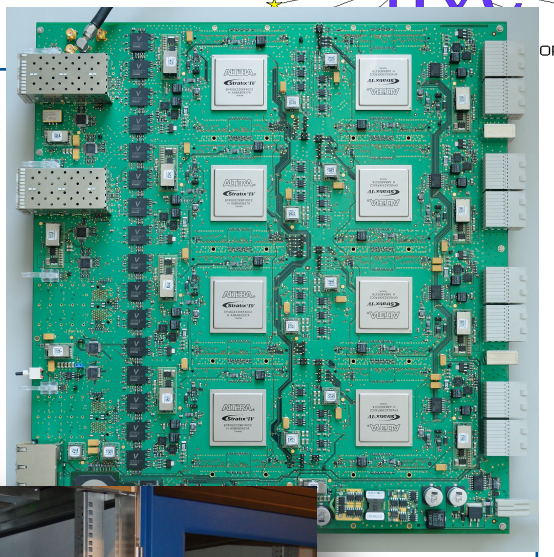
Board Meeting – Copenhagen - June 20, 2012

6

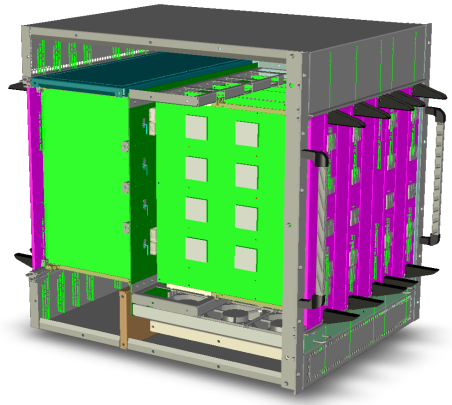


UniBoard

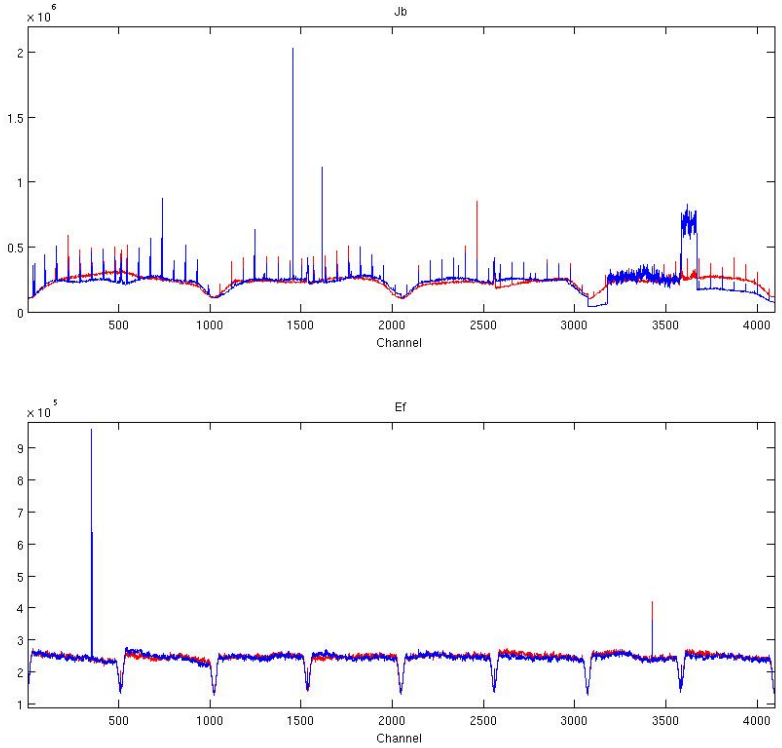
- Project formally ends June 30 2012
- Several boards at Shanghai, one at Bonn, a second board at JIVE
- Many boards for Apertif
  - Very noisy…
- Lot of development



- UniBoard^2 starts July 1 2012
  - Aims for more CPU, less power consumption
  - Project straddles two technologies, 20 and 28 nm
  - Slow start, try to use latest
  - Will need active support from FPGA producer



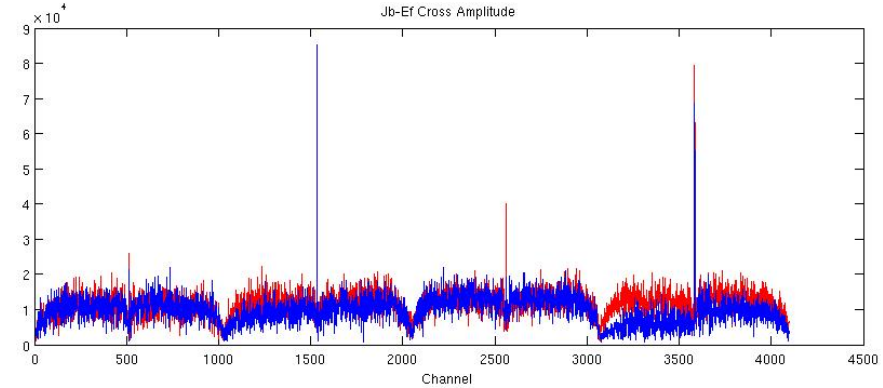
UniBoard correlator: autocorrelations

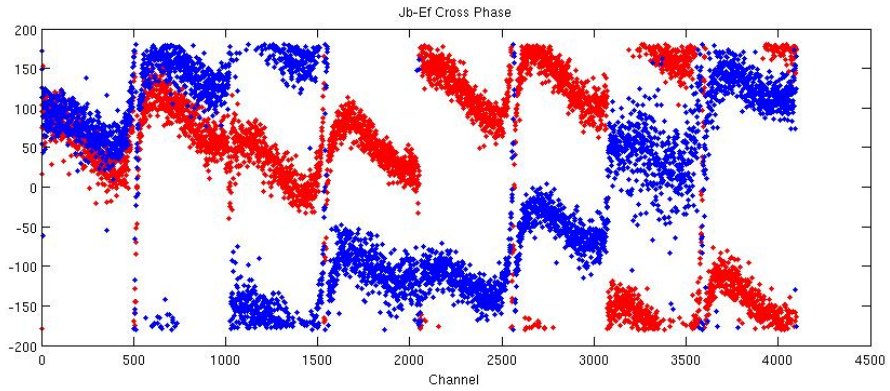


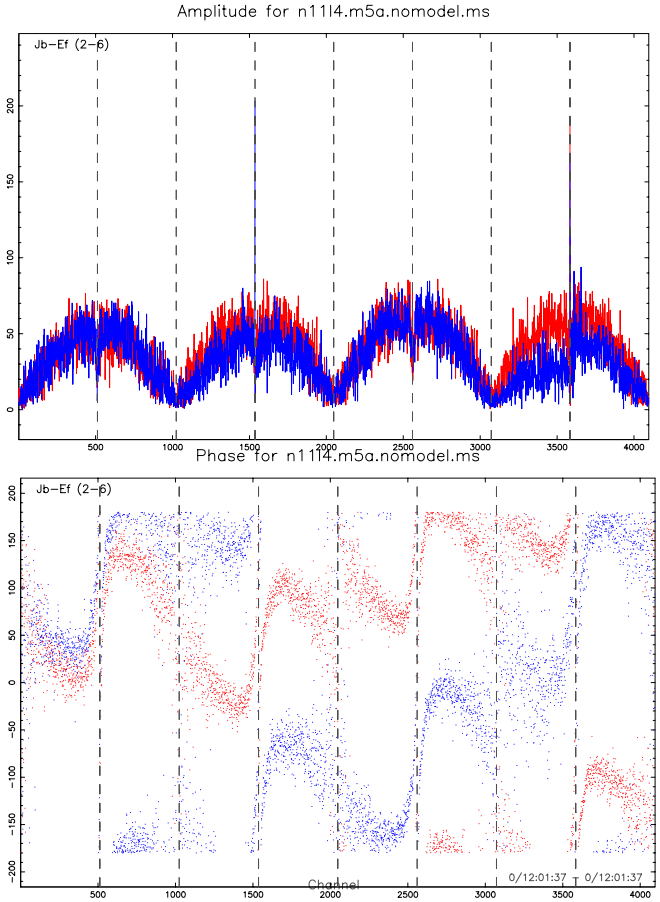
UniBoard

SFXC

UniBoard correlator: cross correlations







UniBoard

SFXC

4 Gbps recording/1 Gbps real time

- Part of deliverable D5.2
- Ef, On, Yb
- DBBCs in PFB mode
- Yb DBBC sent back to MPG for troubleshooting
- On DBBC: clock jumps
- Fila10G cards
  - Only 3 available (4?) available in all of Europe
  - Of which one was sent to Chile…
  - Only ever tested at 2 Gbps
- Mark5C recording at 4 Gbps
  - Never tested in EVN(?)
- Yebes 10G connection just up and running

- What could possibly go wrong!!!

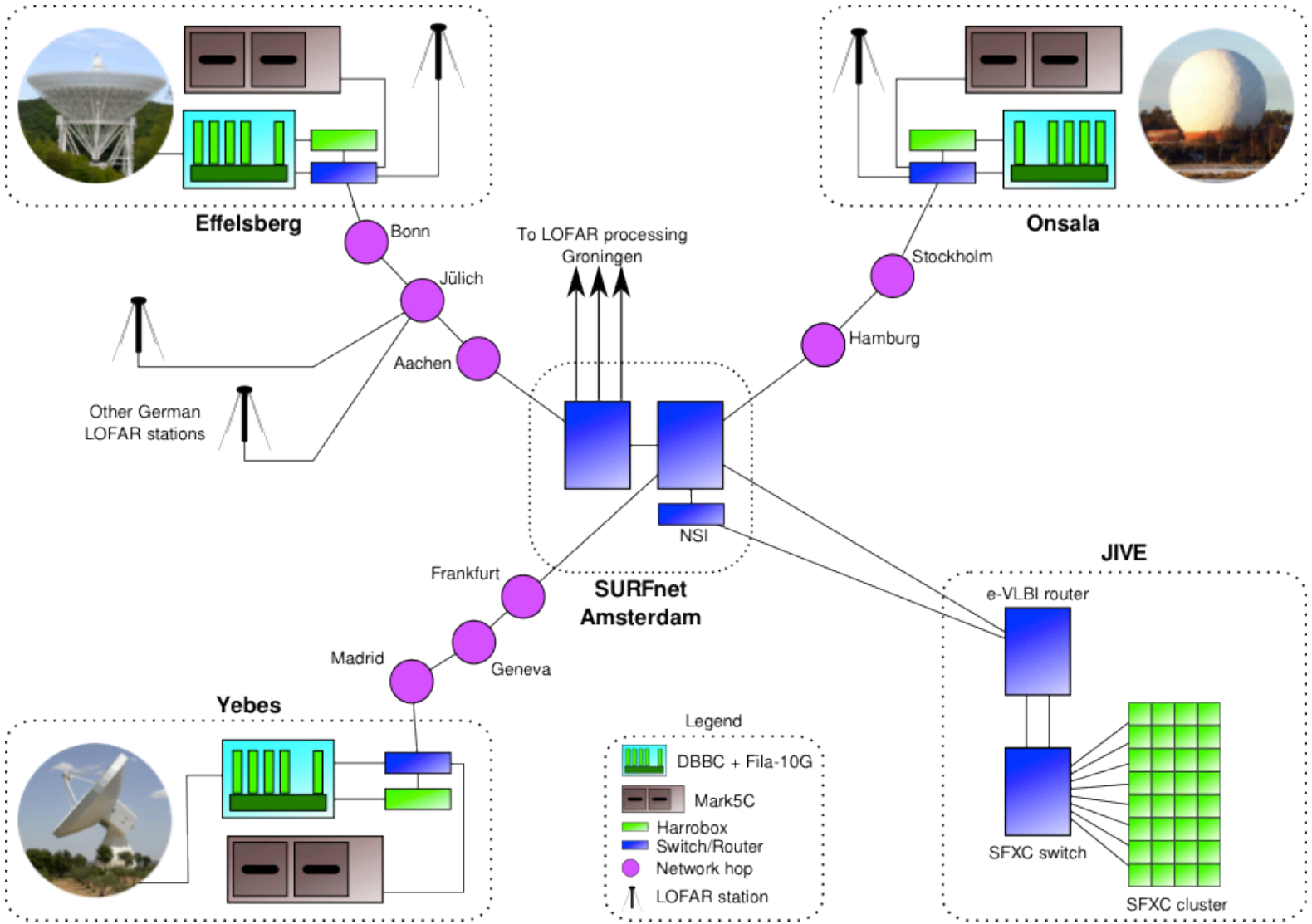
Telescopes

With thanks for the kind cooperation of

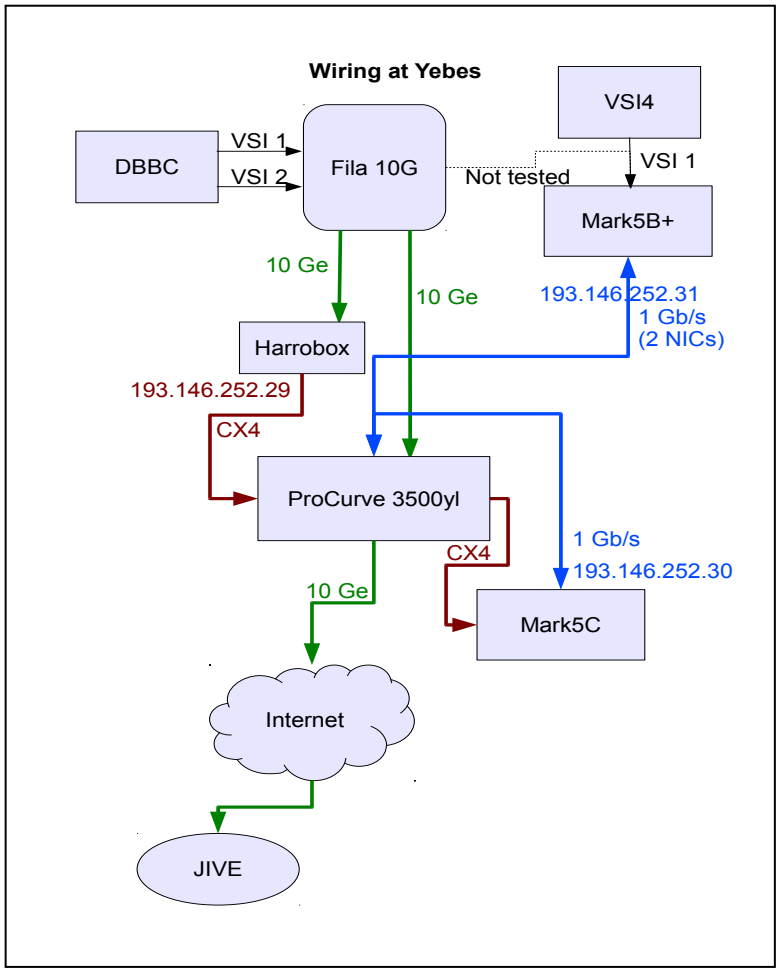
4 Gbps demo

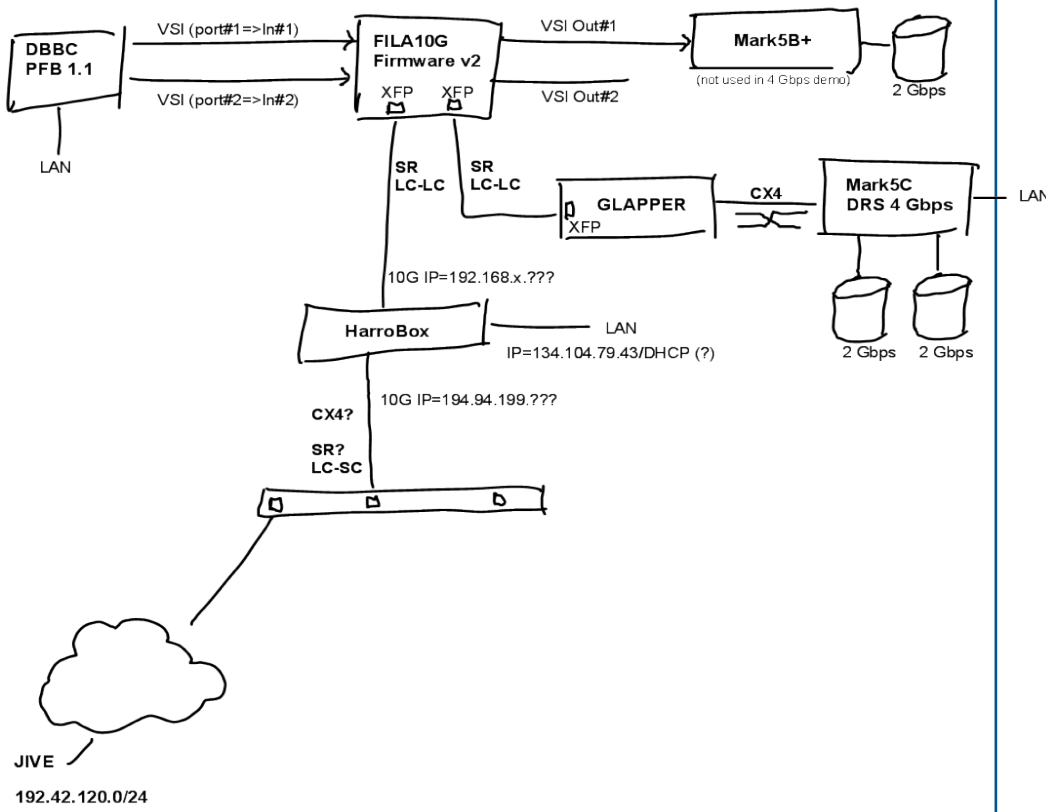
- Mark5C shipped from JIVE to Yb
- Fila10G from Chile to Germany in hand luggage (stuck in customs)
- Fila10G for Mh on loan to Yb
- Modules for switches, cables
- Powerful 1U servers with multiple 10G interfaces purchased, shipped to stations, installed (HarroBoxes)
- Software for “chunking” written
- Modifications to SFXC correlator
- *much* testing, bug fixing, new insights
- Excellent way to get many techniques and tools developed in NEXPReS to actually work and work together
- Fantastic support from networks

4 Gbps demo


Effelsberg
Bonn
Jülich
Aachen
Other German
LOFAR stations
To LOFAR processing
Groningen
Onsala
Stockholm
Hamburg
NSI
SURFnet
Amsterdam
Frankfurt
Madrid
Geneva
Yebes
JIVE
e-VLBI router
SFXC switch
SFXC cluster
Legend
DBBC + Fila-10G
Mark5C
Harrobox
Switch/Router
Network hop
LOFAR station

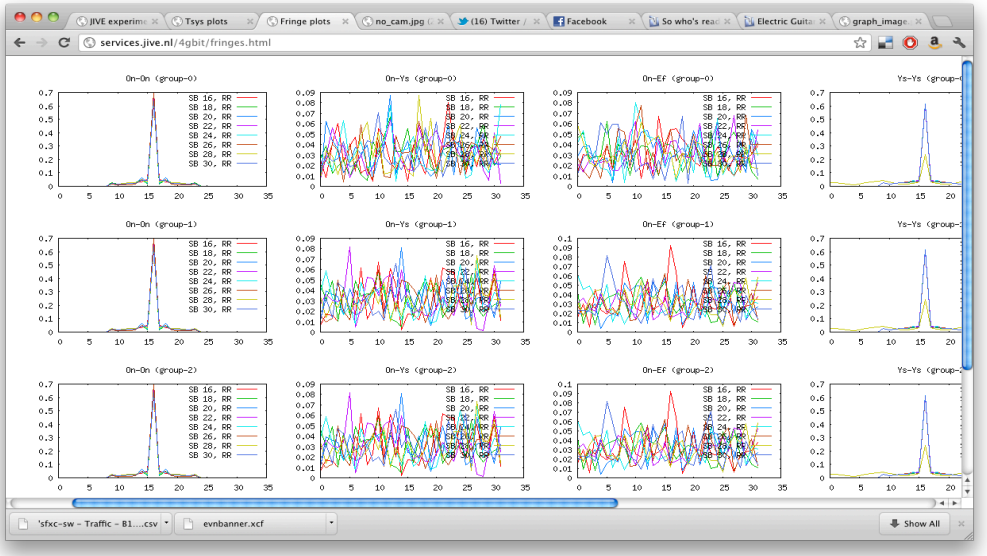
4 Gbps demo: local networking setup





4 Gbps demo: results (June 20)

- Some initial problems
  - Flooding
  - Mark5C configuration
  - Scan length recording issue
  - Some packet loss at Ef
- But, technically everything just worked!!!
- All equipment keeping up
- Networks stable and performing flawlessly
- But….. No fringes
- DBBC configuration, Fila10G time synchronization?
- Completely new equipment, need to learn

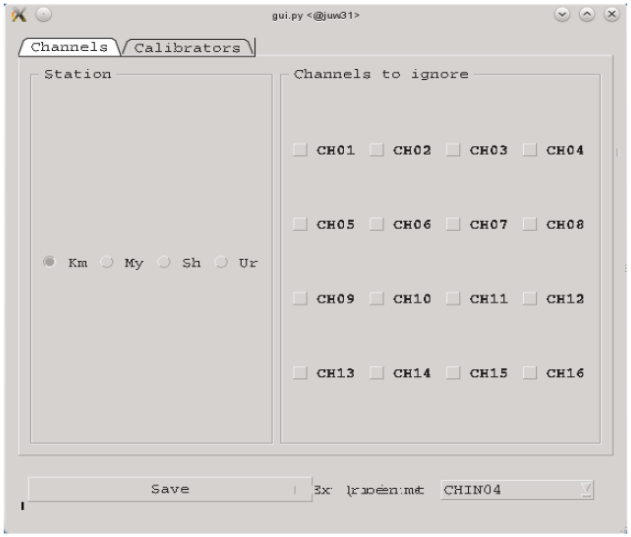


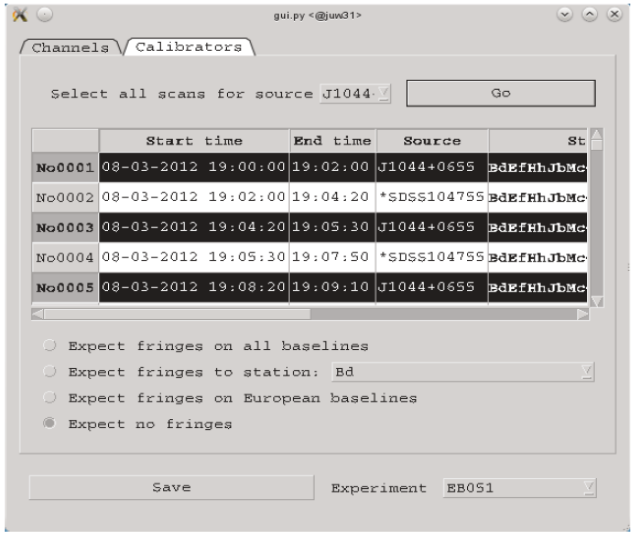
NEXPReS status

- Cloud correlation:
  - TUM and MPG making good progress
  - Tool for system monitoring/alerting in place
- High bandwidth on demand
  - Standard has been decided upon
  - Successful BoD demo Onsala-JIVE, Jodrell Bank-Metsahovi at 4Gbps
  - Providing NRENs with use case
- Computing in a shared infrastructure
  - Many new features added to SFXC
  - Demonstration of automated triggered observation very succesful
- High-bandwidth, high-capacity networked storage
  - Hardware platform purchased at many sites
  - Speed of development has picked up considerably

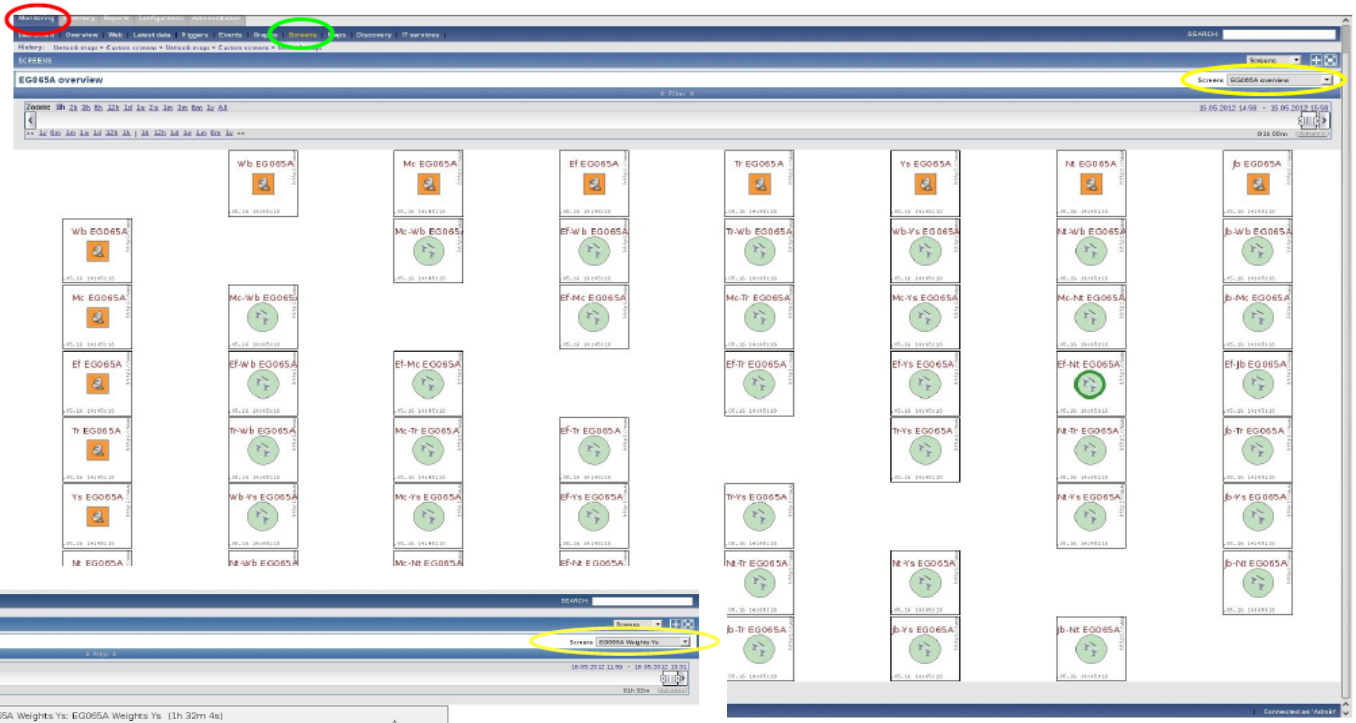
Continuous Automated Intelligent Monitoring system

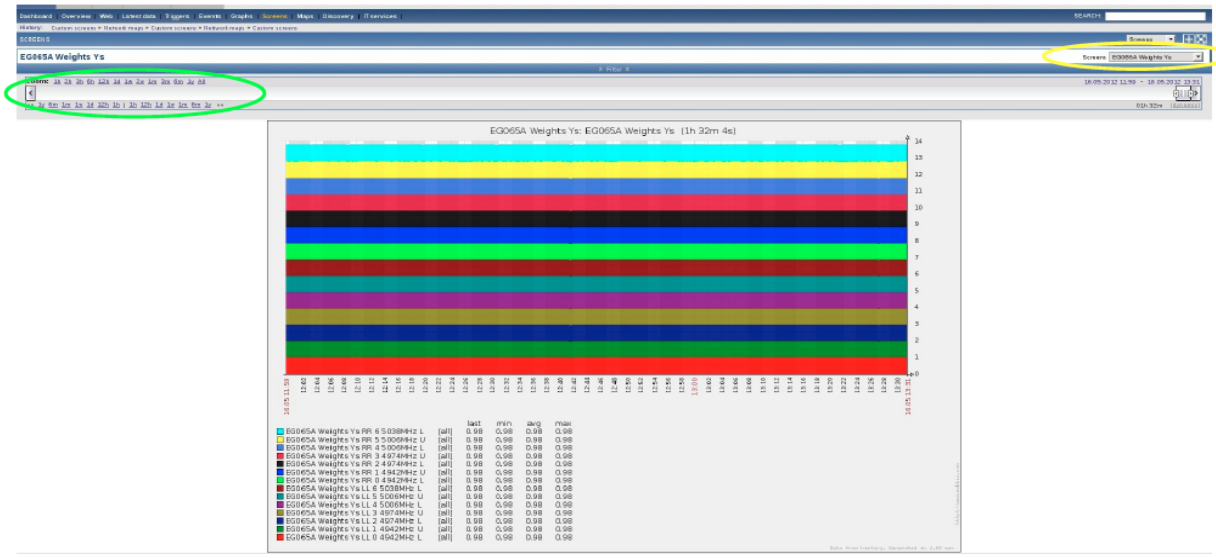
- Based on Zabbix
  - Used for monitoring hardware health of Mark5s, cluster nodes, switches, etc
- Monitors “quality” of fringes of selected calibrators, weights
- Generates warnings via email (or sms)



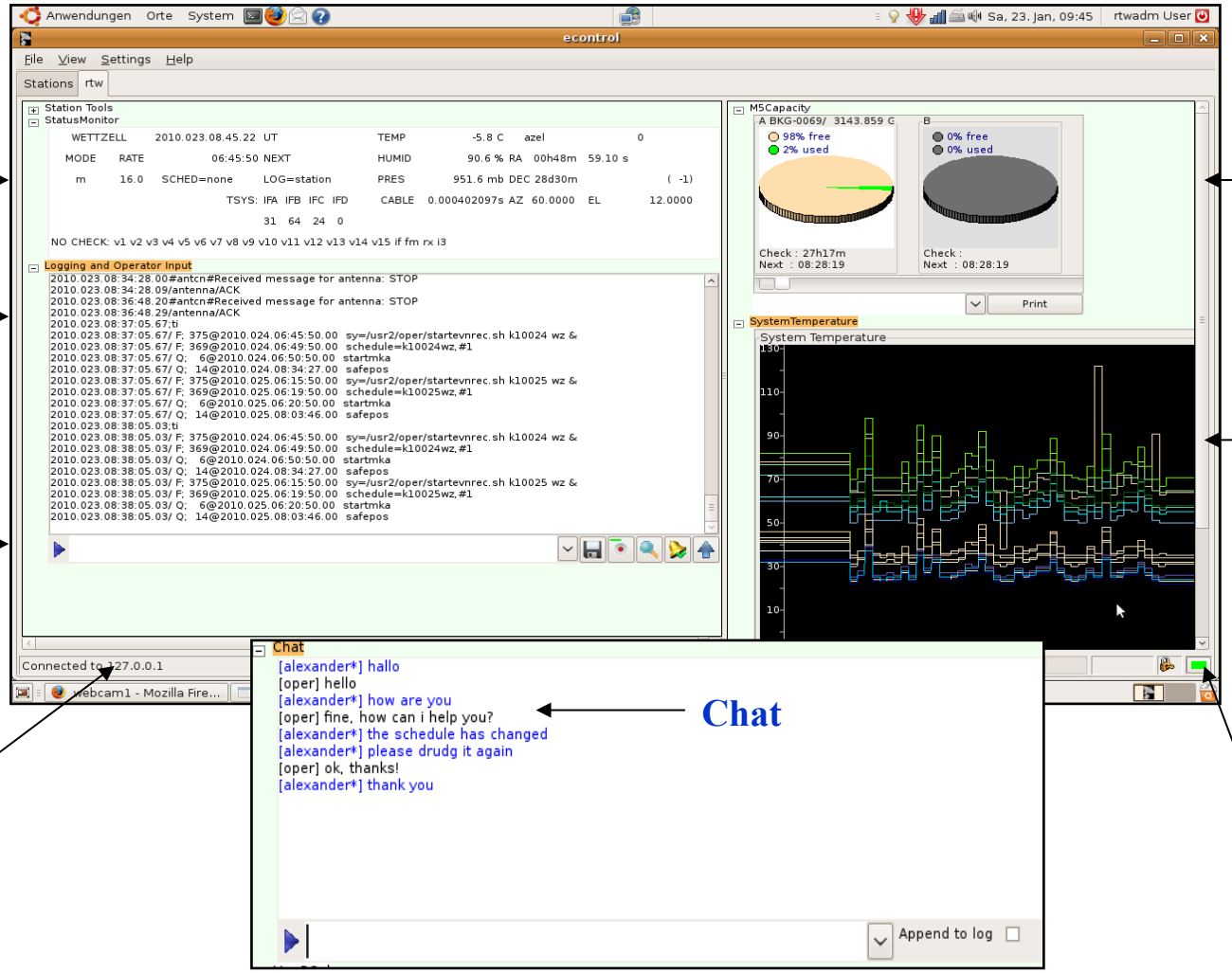


CAIM: fringe and weight monitoring





„e-RemoteCtrl“ software



Status monitor

Logging

User input

Mark 5 capacity

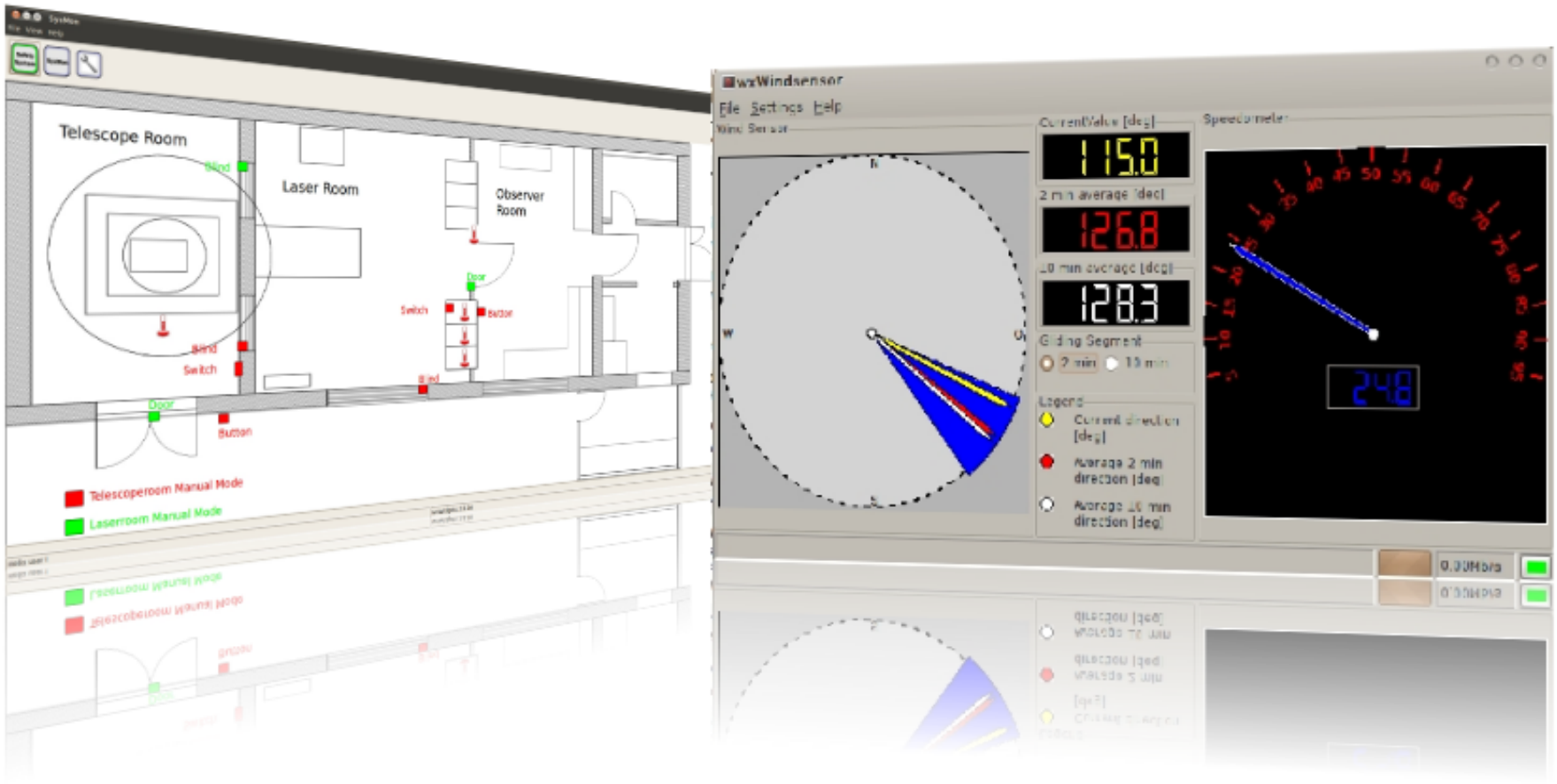
System temperature

Chat

Connection information

Connection state

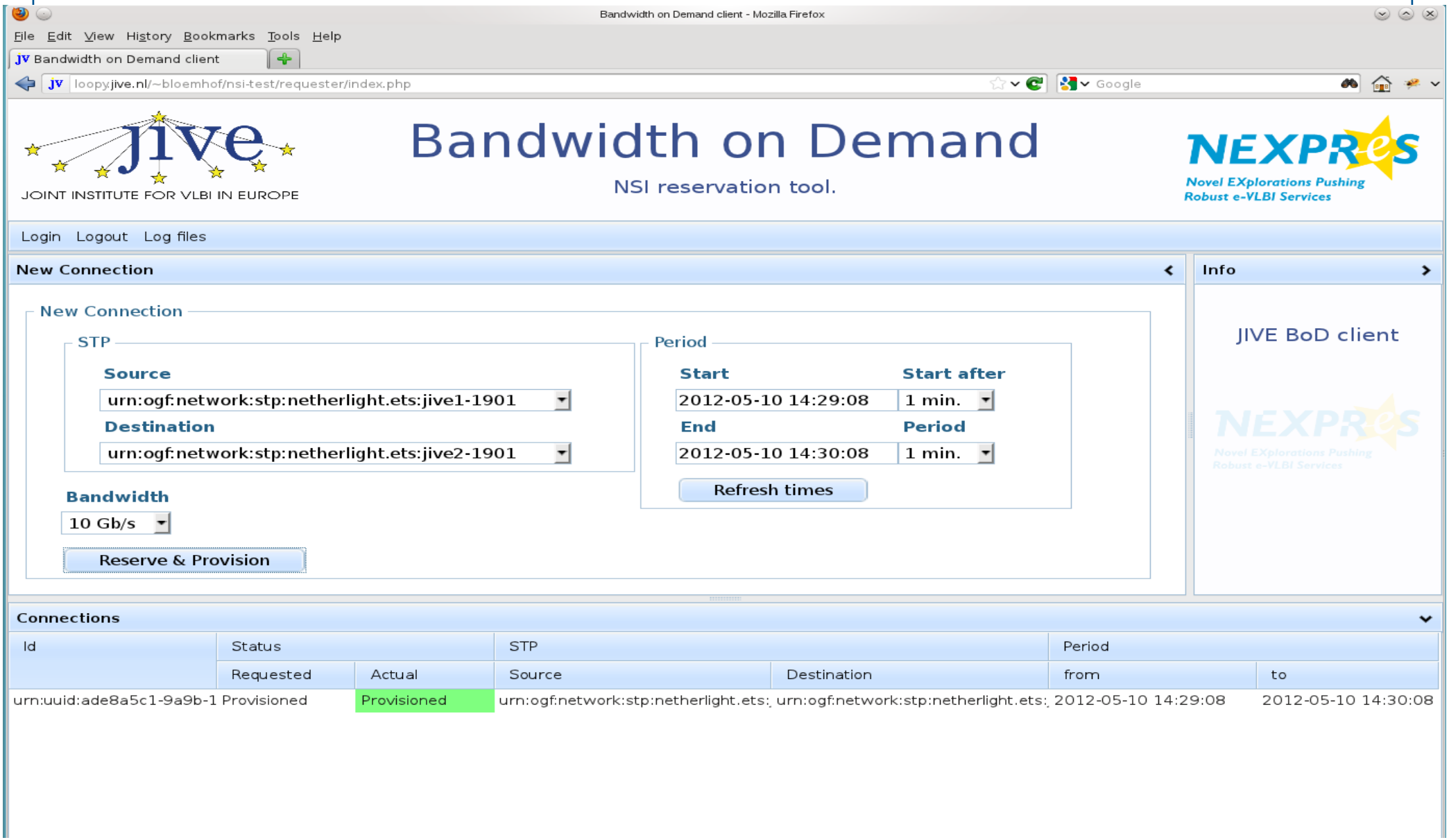
SysMon – System Monitoring at Wettzell



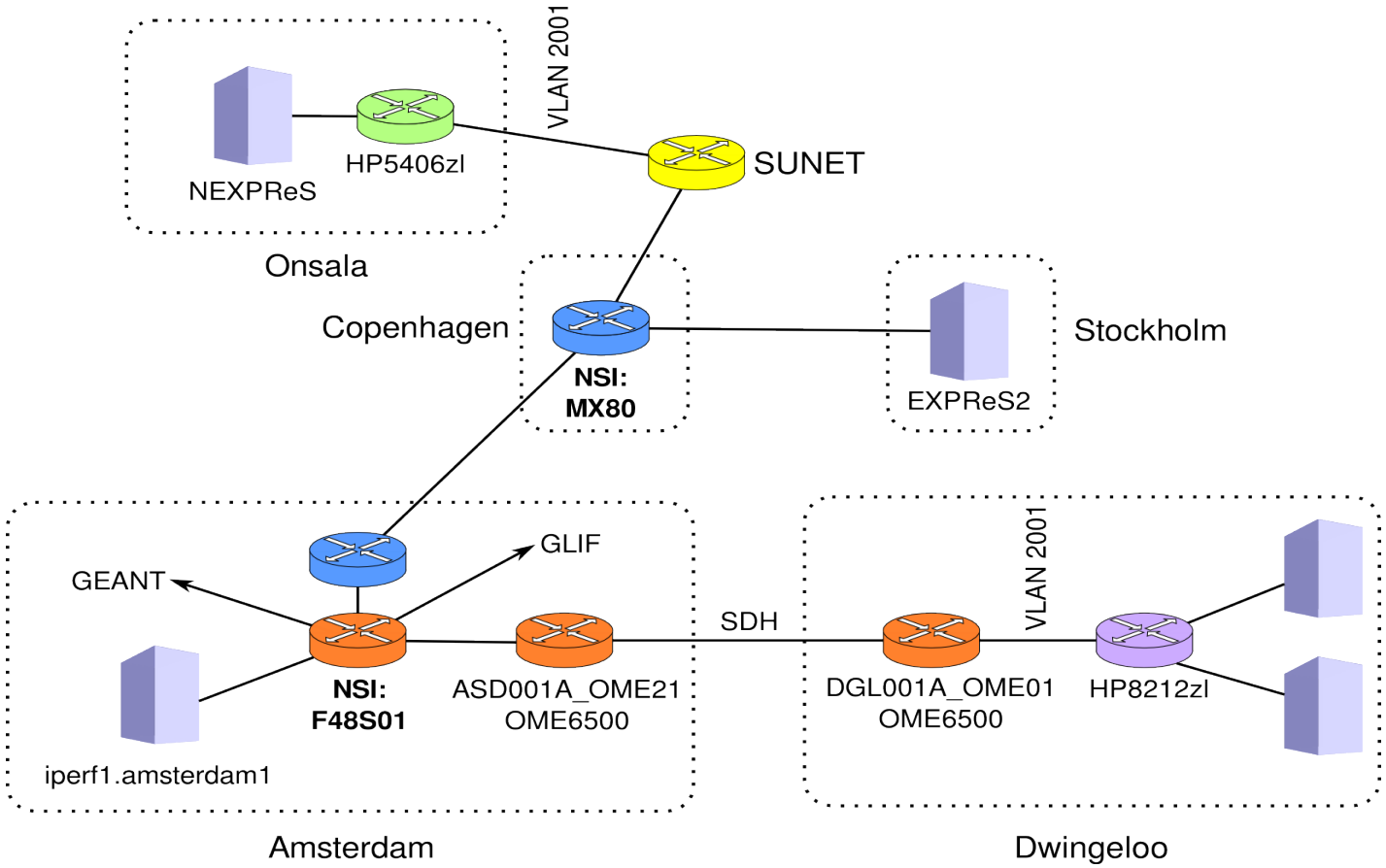
Safety-system display

Wind sensor display

NEXPReS NSI Client screen shot



International BoD at 4Gb/s



International BoD at 4Gb/s