eVLBI Experiments in Finland

Jouko Ritakari
Metsähovi Radio Observatory
Jouko.Ritakari@hut.fi
Unix File Approach

- Data is stored into normal files
- VLBI data is normal data
- Minimal programming and development
- Use of normal Unix tools
- Data transfer with FTP (or the programs used in Mark5A)
Metsähovi VSI Data System
Evolution

Jun-2001  First wired prototype
Jul-2001  Tests of sustained Linux disk performance
Oct-2001  First prototype VHDL ready and running at 8bit@32MHz
Jan-2002  VSIB and VSIC PCB board design ready
Mar-2002  Second prototypes assembled and tested at 32bit@18MHz
Apr-2002  Last PCB changes for mass-production
Jun-2002  256Mbps VSIB&VSIC playback tests at JIVE
12-Jul-2002  Fr! 256Mbps Mk4/5P Westerbork disk-Jodrell tape at 5GHz (fringes at JIVE)
Aug-2002  Total of 100 VSIB and VSIC boards produced
24..26-Sep-2002  256Mbps iGRID e-VLBI demo (JB, WB, JIVE)
26-Sep-2002  1Gbps ADS-1000 MH-Kashima 22GHz (RX problems)
2-Oct-2002  1Gbps ADS-1000 MH-Kashima 22GHz (weather problems, Kashima typhoon)
16-Oct-2002  Fr! 1Gbps ADS-1000 MH-Kashima 22GHz (fringes found on W3OH at CRL)
22-Nov-2002  1Gbps Mk4/5A MH-Jodrell 22GHz (RX problems)
27-Nov-2002  1Gbps ADS-1000 MH-Kashima 22GHz (weather problems, MH snow)
5,7,13,14-Feb-2003  Fr! 1Gbps ADS-1000 MH-Kashima 22GHz (fringes found on 3C454.3 at CRL)
12-Mar-2003  Fr! 1Gbps Mk4/5A MH-Jodrell 22GHz (fringes on 3C84 at JIVE)
Experiments with Kashima/CRL

- First International 1Gbit/s fringes in Oct 2002
- First International 1Gbit/s continuum fringes in Feb 2003
- Direct IF sampling with the ADS-1000 Gbit/s sampler developed in CRL
- High-speed software correlation in CRL
First European 1Gbit/s fringes 12\textsuperscript{th} of March 2003

- Water maser (W3OH) source for debugging and fringe search, followed by a continuum radio source (3C84)
- Recording with MRO designed systems, playback with Mark5A
Of course we had a few problems...

- Rx problems in 2002
- Rack number needed to be even
- Data had to be reformatted
- Slow eVLBI transfer due to high CPU usage
First European 1Gbps Fringe
Metsähovi - Jodrell Bank
2003-03-12

Subband 6

Subband 8
Lessons learned

- Standard microcomputers are fast enough
- E-VLBI is easy as long as normal files are transferred
- A surprising number of things stop working if the file concept is not used
- ALL the motherboards have 300-600 Mbit/s performance limit, none can do 1Gbit/s
Equipment

- Recording system designed at MRO
- Minimal hardware and software design
- Partly designed in the PCEVN project
- VSI compatible
- FW and SW frozen in September 2002
- No technical problems, just keeps on working
Discount eVLBI equipment

0.5Gbps for 1200 euros! (VSIB+VSIC+Cable)
The whole VLBI community was enthusiastic...