

The UniBoard

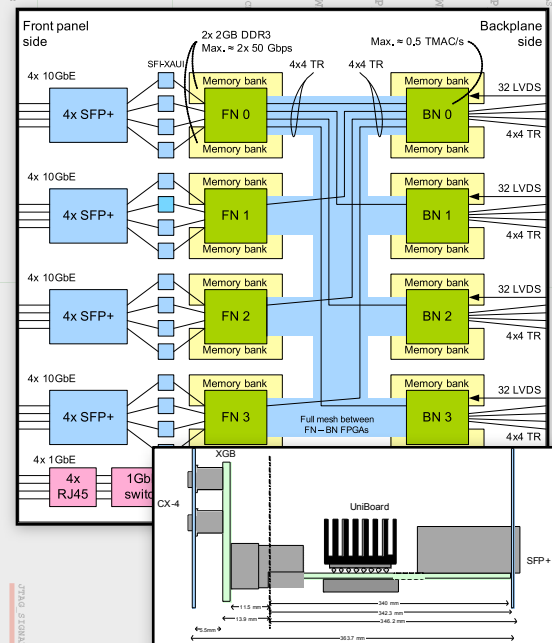
A multi-purpose, scalable, high-performance computing platform for radio-astronomical applications

Contract nr. 227290

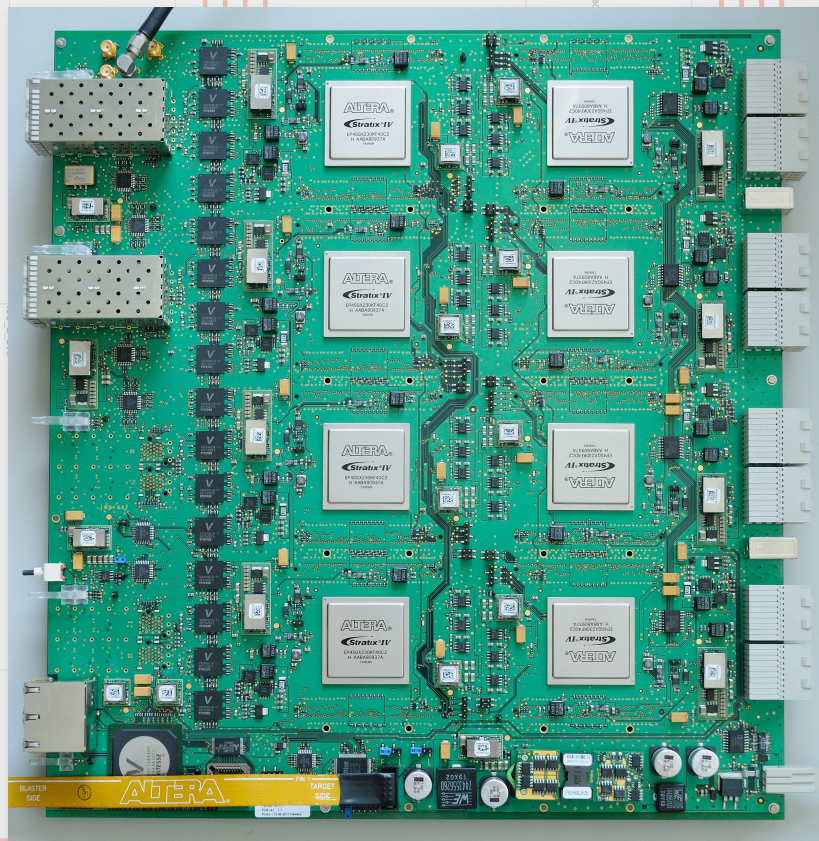


The Project:

- Concentrate as much computing power and I/O as possible on a “reasonably” sized PCB
- Based on state-of-the-art FPGAs for best performance/shortest development time
- Take advantage of expertise at Astron obtained through Lofar development
- Keep board interfaces as generic as possible (1 and 10G Ethernet, DDR3 memory)
- Develop several demanding radio-astronomical applications: correlator, beamformer, digital receiver, pulsar binning machine.
- Maximize project-wide re-use and exchange of VHDL code through a shared repository.
- Test bench for SKA instrumentation: several Tflops/board, power efficiency, volume
- 3-year project, started January 1 2009, funded by EC and participants (total of 1.4 Meuro)



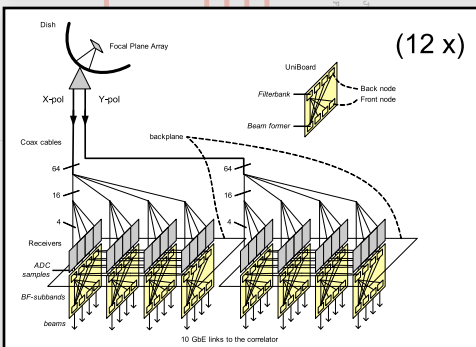
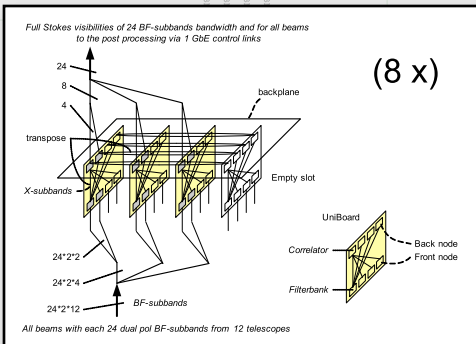
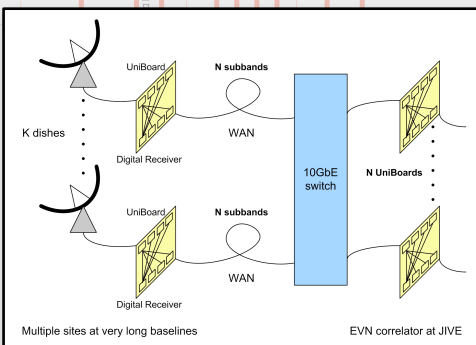
UniBoard design. Bottom: XGB, 10G Break-out board for stand-alone operation



Prototype, delivered May 17, 2010

The Hardware:

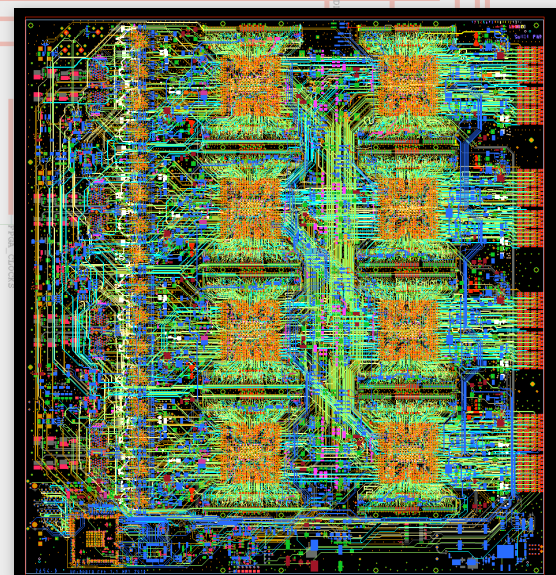
- 8 × Altera Stratix IV 40nm FPGA, type EP4SGX230KF40C2, 1288 multipliers, 1517 pins
- One front node → all back nodes mesh
- 14 layers
- 8 × 2 DDR3 modules
- 4 × 4 10GbE links in
- 4 × 4 8-bit LVDS out
- Estimated maximum power consumption 280 W



Various implementations of UniBoard: digital receiver and VLBI correlator (top), Apertif correlator and beam former connected through backplane (middle and bottom)

The Participants:

- Joint Institute for VLBI in Europe (JIVE)**, the Netherlands (project lead, VLBI correlator)
- Netherlands Institute for Radio Astronomy (ASTRON)**, the Netherlands (hardware development, Apertif correlator and beamformer)
- Université de Bordeaux**, France (digital receiver)
- Université d'Orléans**, France (RFI mitigation for pulsar binning)
- Instituto Nazionale di Astrofisica (INAF)**, Italy (digital receiver)
- University of Manchester**, United Kingdom (pulsar binning machine)
- Korea Astronomy and Space Science Institute (KASI)**, Korea (VLBI correlator)
- Shanghai Astronomical Observatory**, China (VLBI correlator)
- University of Oxford**, United Kingdom (all-station Lofar correlator)



UniBoard, completed layout