ASTRON *expertise and ambitions*

Peter Maat

ASTRON activities

LOFAR

- **LOFAR - WAN**
  - Antenna station connections (dedicated network)
- **E - LOFAR**
  - Antenna station connections (public network)
  - Remote data processing
  - Remote data storage

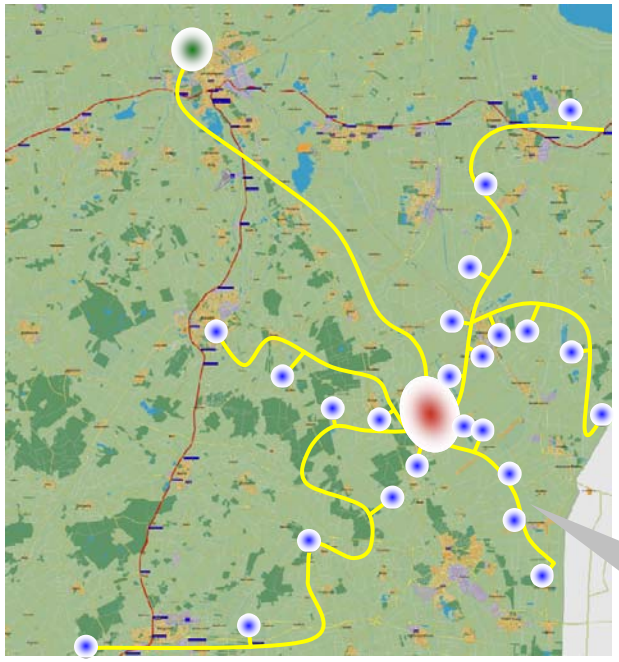
SKA

- **SKA data transport investigations (SKADS)**
  - Optical analogue signal transport
  - Network design and configuration

LOFAR - WAN

LOFAR - arms

- ~ 45 stations
- 2 Gb/s per station
- Distance to LOFAR - Core < 80 km



LOFAR - Core

- ~ 32 stations
- 2 - 20 Gb/s per station
- Intra - Core distance < 5 km

LOFAR - WAN

ASTRON approach for WAN

- **Employ COTS equipment (high performance @ low costs)**
  - **Good reliability / availability (qualified equipment)**
  - **Easy maintenance**
  - **Interoperability**

LOFAR – WAN activities

- **Fibre-optic data transport network design and deployment**
- **Active equipment selection and configuration**
- **Station / central processor interfacing**

LOFAR - WAN

LOFAR - WAN technology

- 1 GbE / 10 GbE
- ASTRON owned fibre and leased lines (G652-C)
- (Stackable) switches
  - 20 – 40 100/1000BASE-T port
  - 2 – 4 1000Base-X pluggable optics ports
- SFP tranceivers (1000BASE-LX, 1000BASE-ZX)
- 1 GbE CWDM / DWDM
- 10 GbE CWDM / DWDM

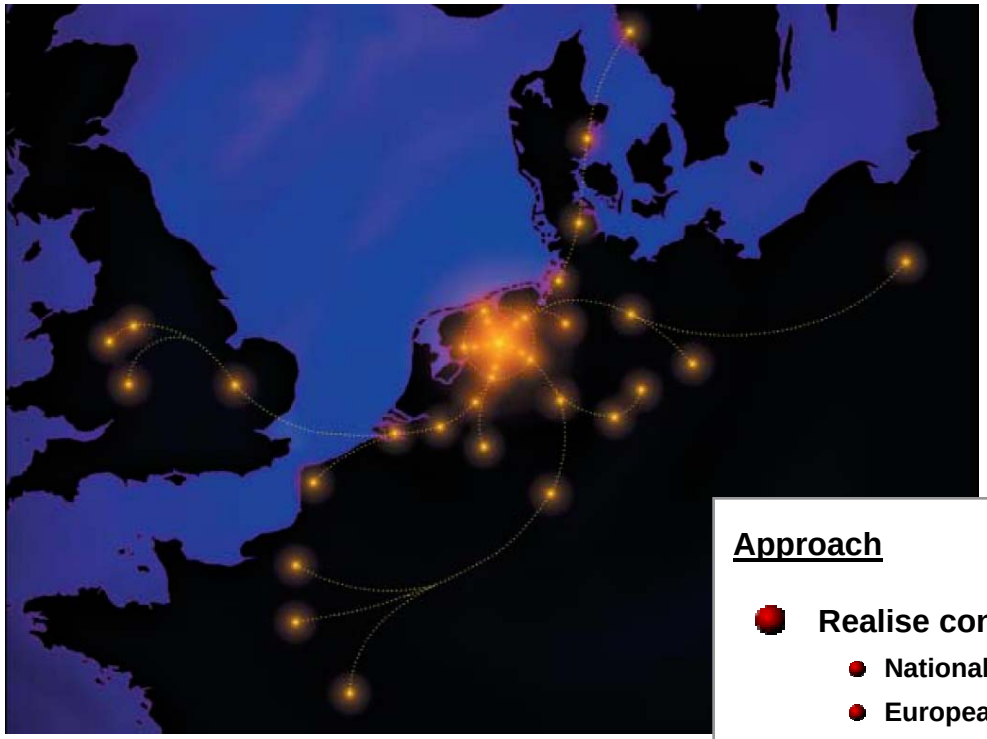
Switch characteristics

- Layer2+ / Layer3 switch
- Support for:
  - Jumbo frames
  - VLAN
  - Multicast
  - QOS
- Controllable by SNMP (with MIB availability)

Data format

- 9k byte jumbo frames
- IP/UDP traffic

E - LOFAR



Approach

- **Realise connectivity via Research Networks**
  - **National**
  - **European**
- **Connection to CEP via Surfnet**
- **Data format: GbE + TBD**
- **Transportation via 1 - 10 GbE lightpaths is preferred**

SKADS network investigations

- **SKA FP6 design study**
  - **30 M€ project**
  - **> 300 man years involved**
  - **32 institutes and companies involved**
  - **UK, France, Spain, Italy, Germany, Sweden, NL, South Africa, Australia, Canada**

SKADS task description for ASTRON

- **Clock signal / M&C signal distribution with COTS communication equipment**
- **COTS communication technology survey and evaluation**
- **Communication equipment pricing and WAN civil work costs survey**
- **Optical analogue link development, domain distribution analogue/digital signal transport**
- **Generation of costing model, network design and evaluation**

FABRIC

LOFAR tasks for establishing E - LOFAR connections

- Arrange data transport connections between E-LOFAR stations and LOFAR-CEP
- Establish data link
- Optimise throughput / configure interfaces / throughput tests
- Investigate / develop data buffering and delay tracking / fringe stopping technology
- Develop / arrange network monitoring interface
- Integration test / sytem test

ASTRON: Public to dedicated network interface

- Inventory network / protocol LOFAR
  - *LOFAR connection strategic document*
- Clock stability and LO distribution
- Extent protocols research for LOFAR
- Tweak for specific performance
- Demonstration of European LOFAR station
  - *LOFAR interface report*

ASTRON interests

- 2.1.1 GRID – VLBI collaboration / 2.1.2 Grid workflow management / 2.1.3 Grid routing
- 1.2.1 Broadband protocols & multicast / 1.2.3 Broadband test