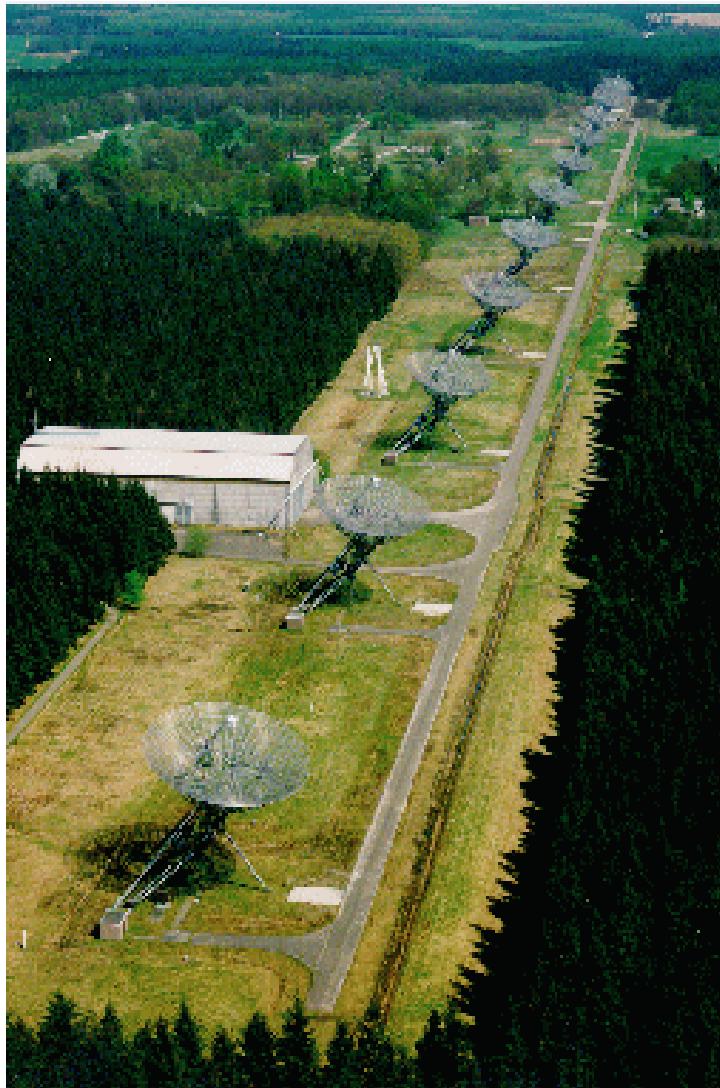


# *LOFAR system overview*

Kjeld v.d. Schaaf,  
15 December 2005

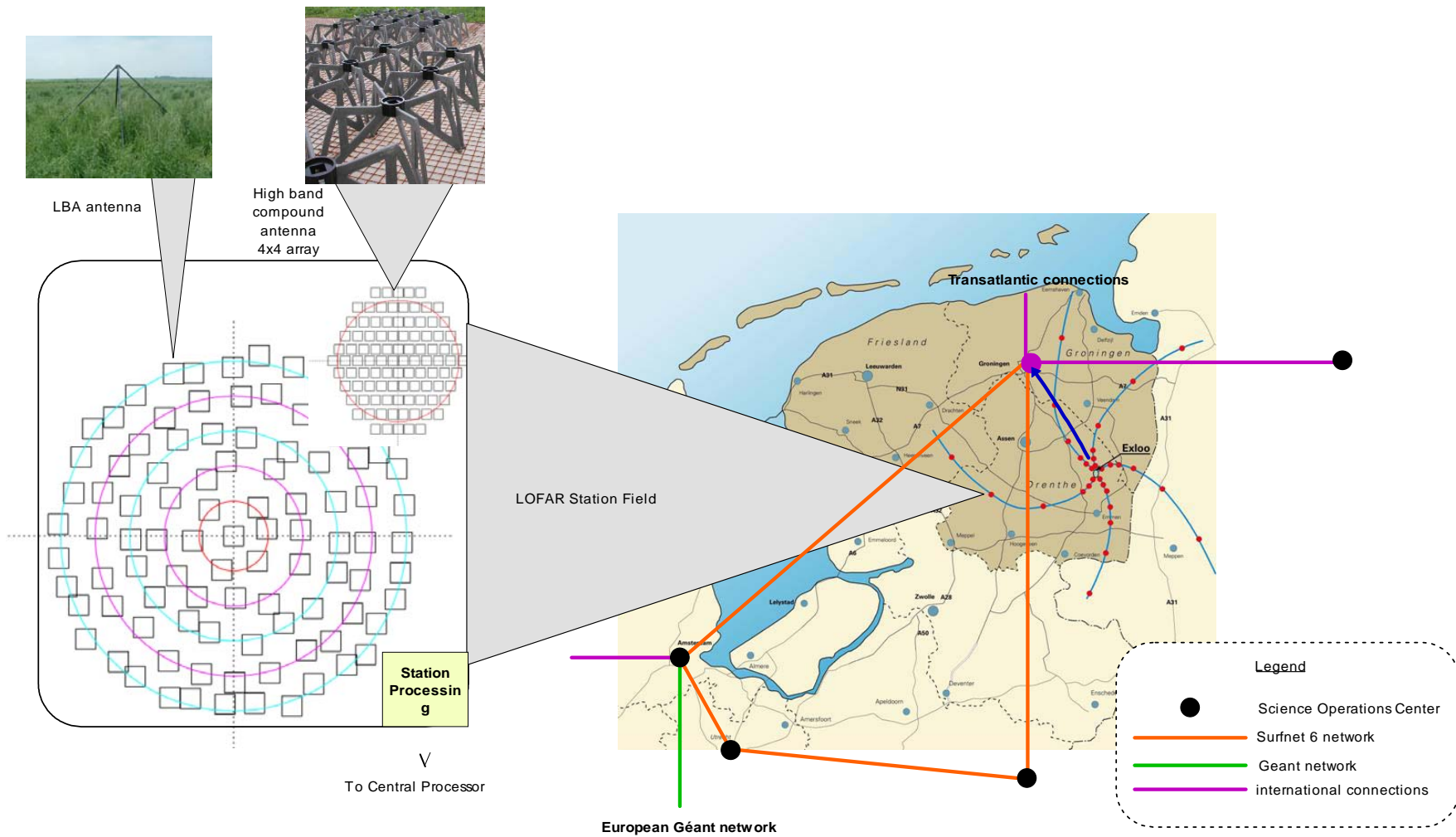




Making astronomical discoveries happen  
Through innovative observing facilities

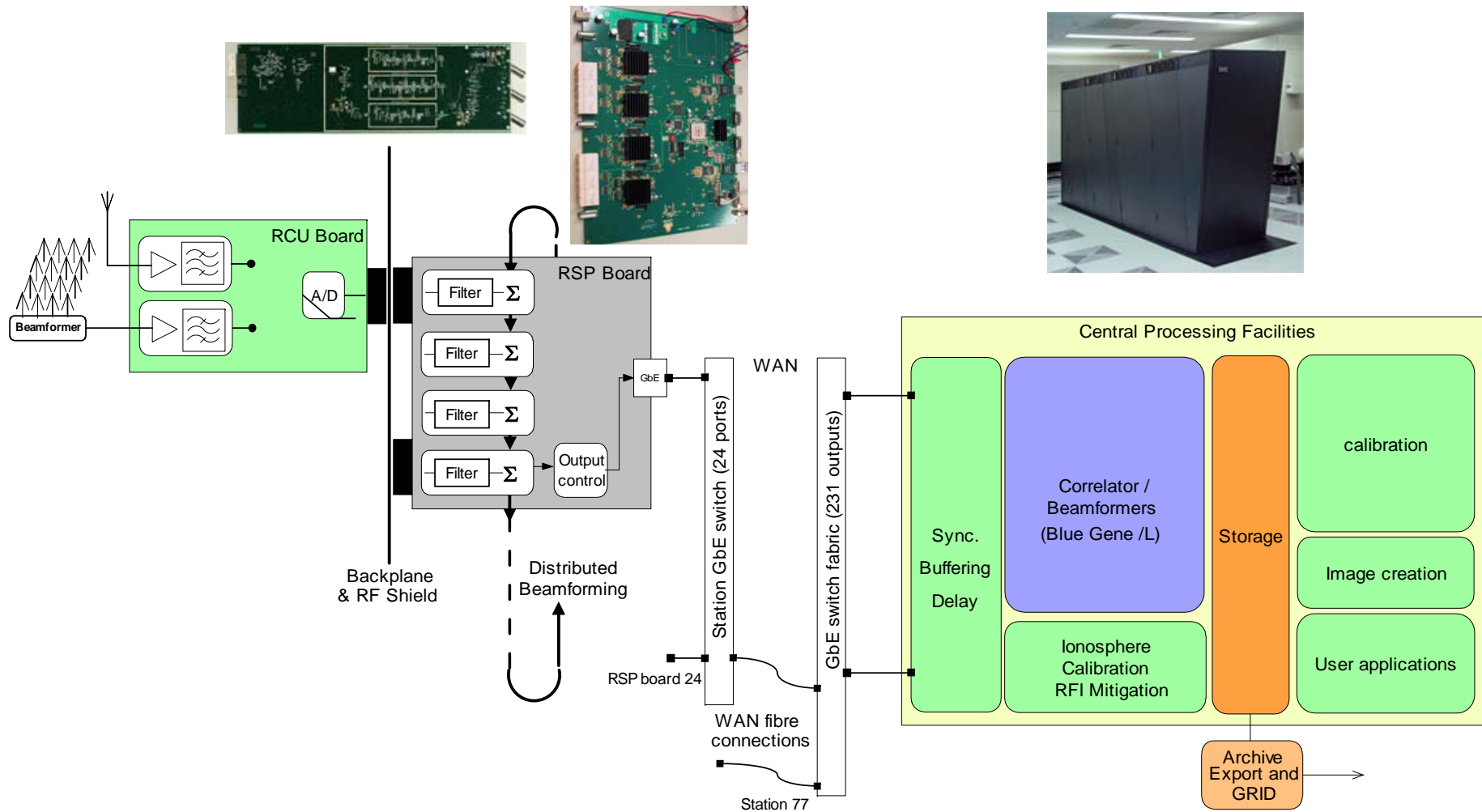


# LOFAR top-level architecture: Geometry view



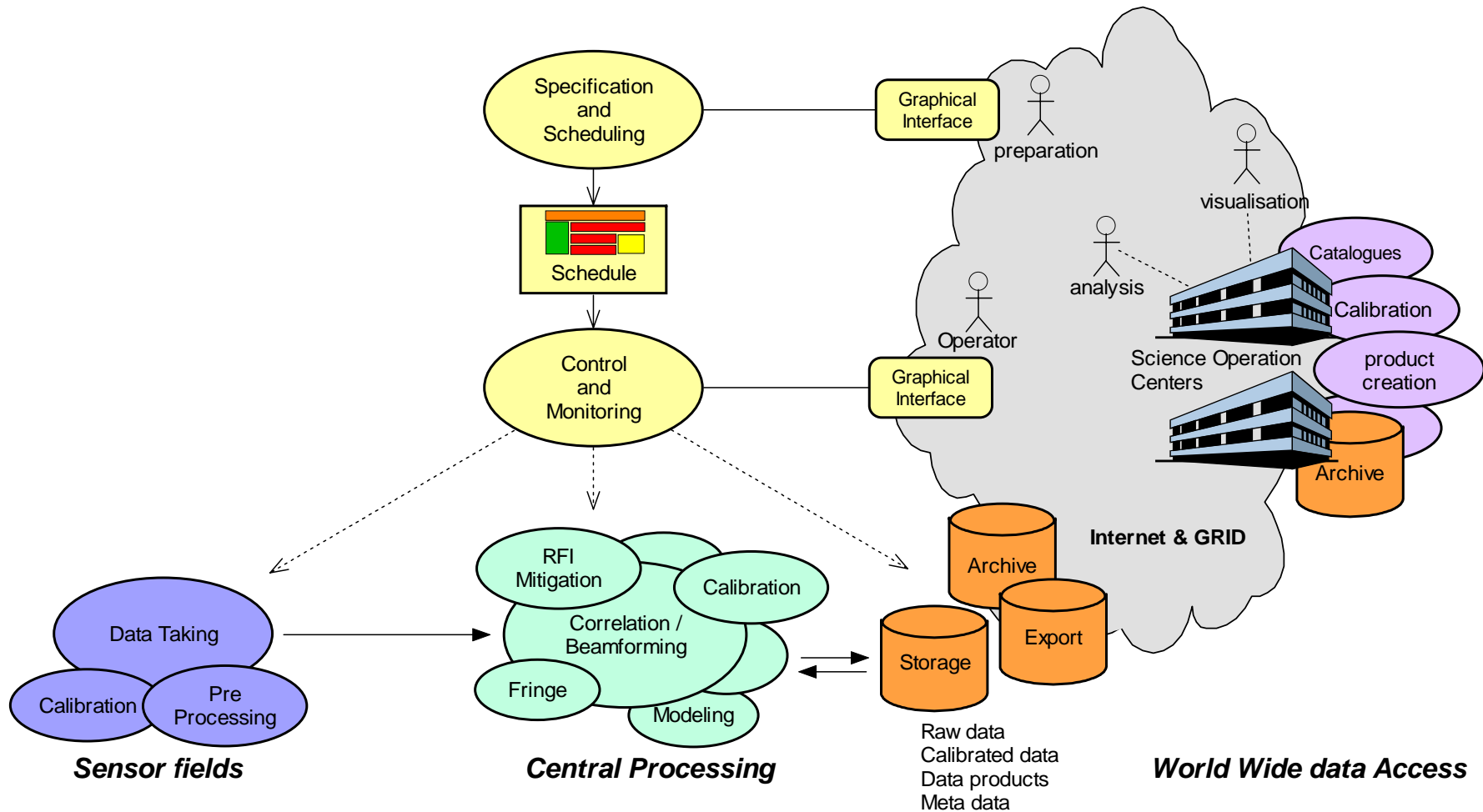
- 77 stations in the Netherlands
  - 32 in Compact Core
  - 45 Remote
  - Logarithmical distribution
- Networks
  - 5 arms
  - Exloo – Groningen connection (max 800 Gbps)
  - GRID
    - SOCs on Surfnet6
    - Géant etc.
- Additional European stations on Géant network

# LOFAR top-level architecture: dataflow view



- FX architecture synthesis array
- Station processing
  - ☞ Analogue amplification and filter
  - ☞ Digitisation
  - ☞ Digital filter (~200 kHz)
  - ☞ Beamforming
- Transport to central site
- Central processing
  - ☞ Delay compensation/fringe stopping
  - ☞ Digital filter (~1 kHz resolution)
  - ☞ Correlation / Beamforming
  - ☞ (on-line) Selfcalibration
  - ☞ Reduction pipelines
  - ☞ Product Generation / user specific software
- Data export and archiving

# LOFAR top-level architecture: operations view



- Continuous automated operation
  - ☞ SAS and MAC management software
  - ☞ Operation over the internet
- User software uses GRID interfaces
  - ☞ High volume processing at LOFAR central processor
  - ☞ Storage and export in general to HPC centers
  - ☞ User owned hardware it treated in the same way
    - e.g. EOR PByte storage facility and re-processing cluster

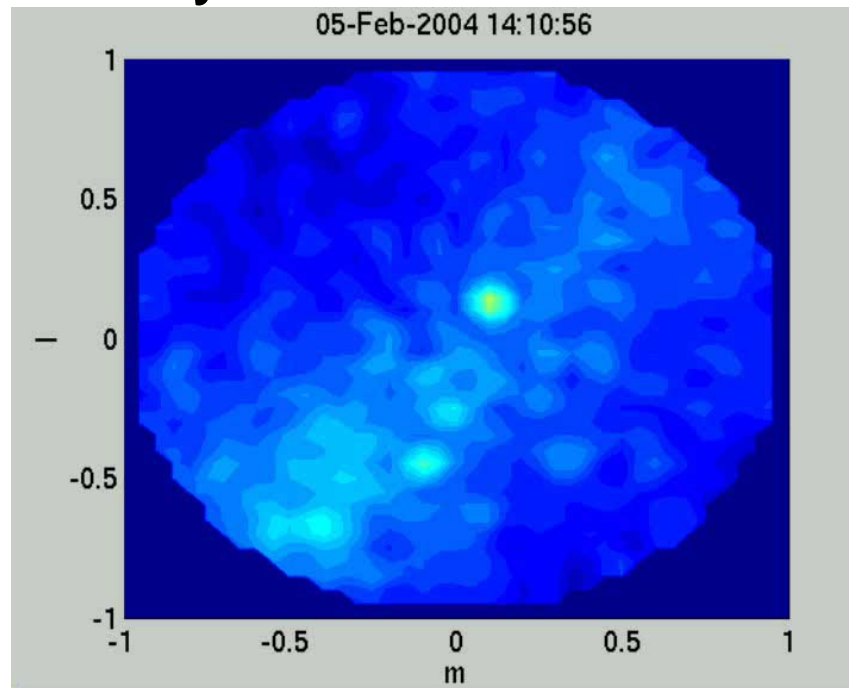


- Low band antenna: 20–80 MHz
- High band antenna: 110-240 MHz
- Geophones
- high precision agriculture



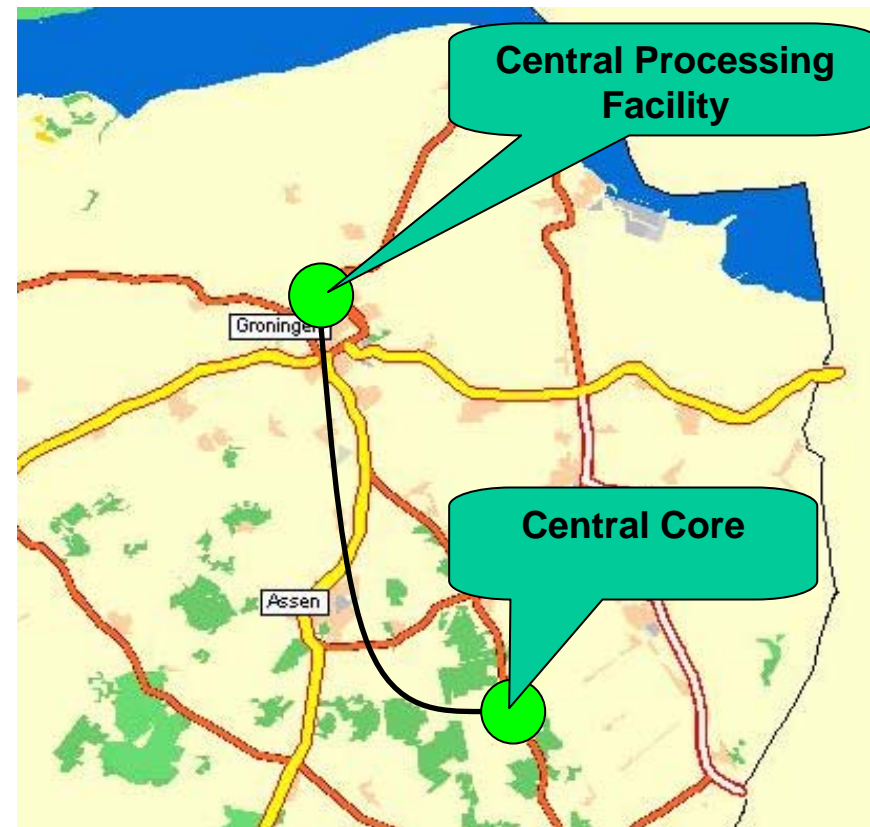


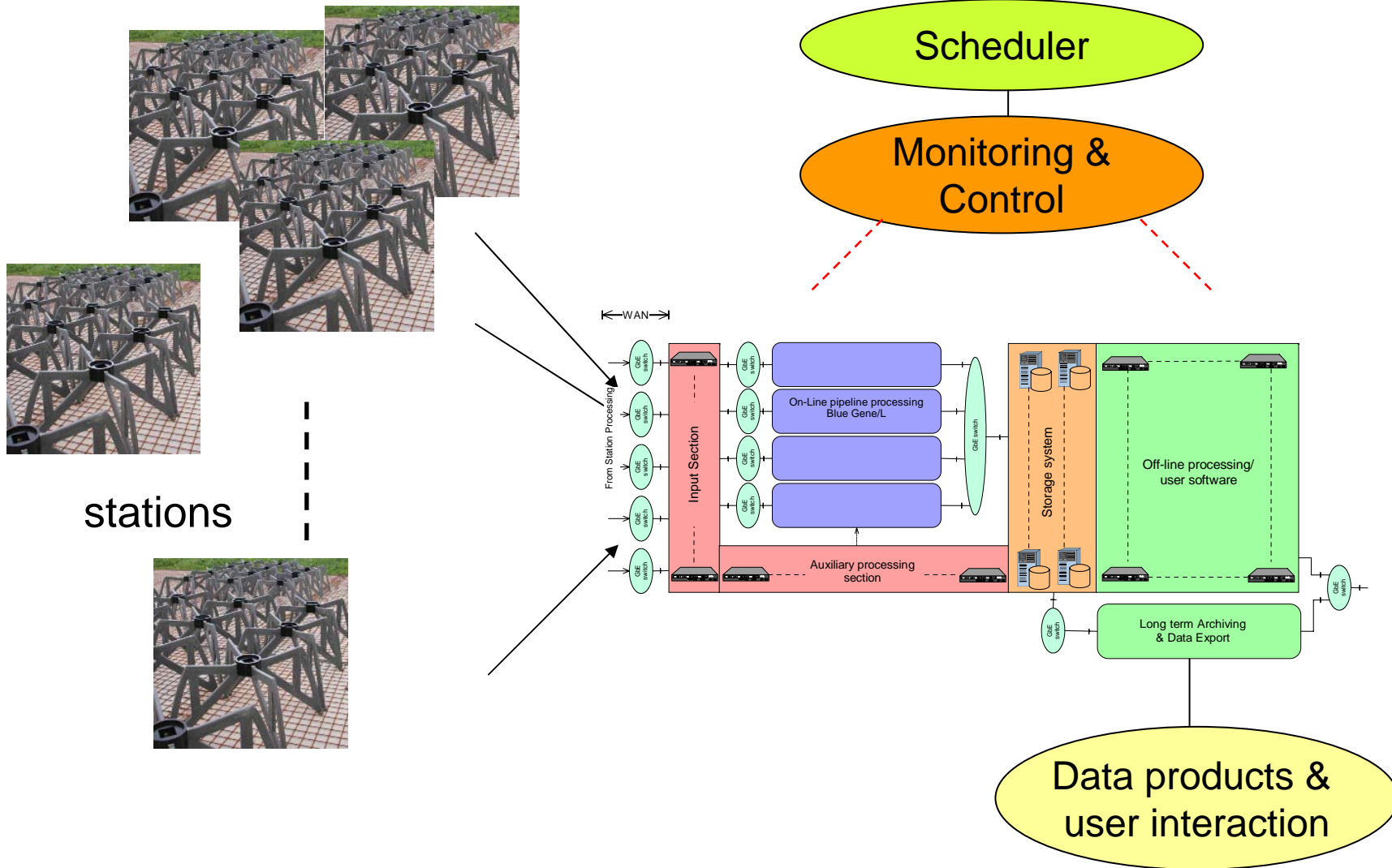
- All sky monitor with limited resolution and duty cycle
  - observed with 25 antennas
  - data recorders capture data with limited duty cycle
- Combine centrally into coherent data stream

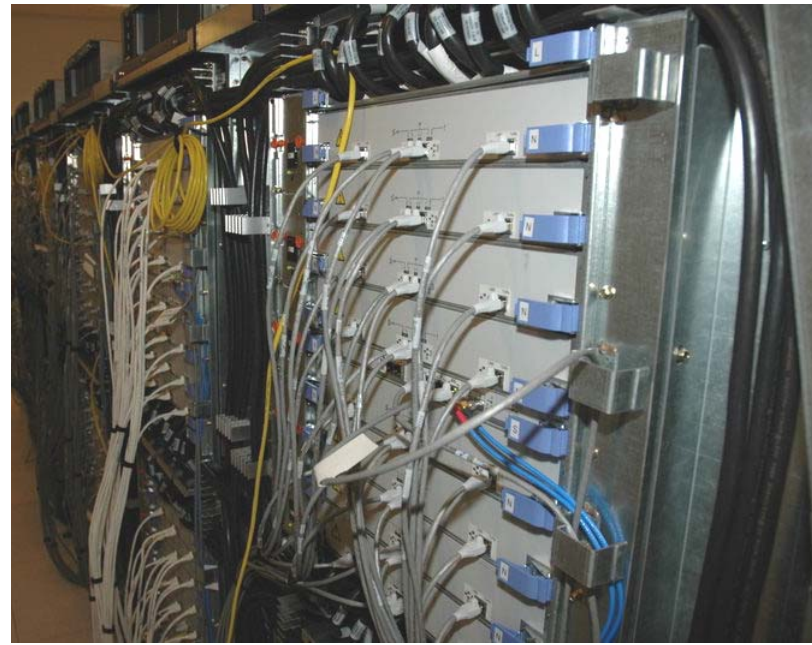


- Data transport from stations and central core to central processor facility
- Dedicated fiber connection between core and central processor
- Full array operation:
  - ☞ 77 stations
  - ☞ each 2 Gbps streaming
  - ☞ ~200 Gbps incl. meta data
- Compact core operations
  - ☞ 32 stations
  - ☞ each ~24 Gbps
  - ☞ ~800 Gbps incl. meta data

**Talk by Peter Maat**







### ➤ Input Cluster

- ☞ Linux cluster with very high bandwidth internal interconnect system
- ☞ Data reception, validation, reordering and synchronisation
- ☞ Gb Ethernet connections to BGL

### ➤ BGL

- ☞ Used for basic processing steps:
- ☞ Filtering, Correlation & Beamforming

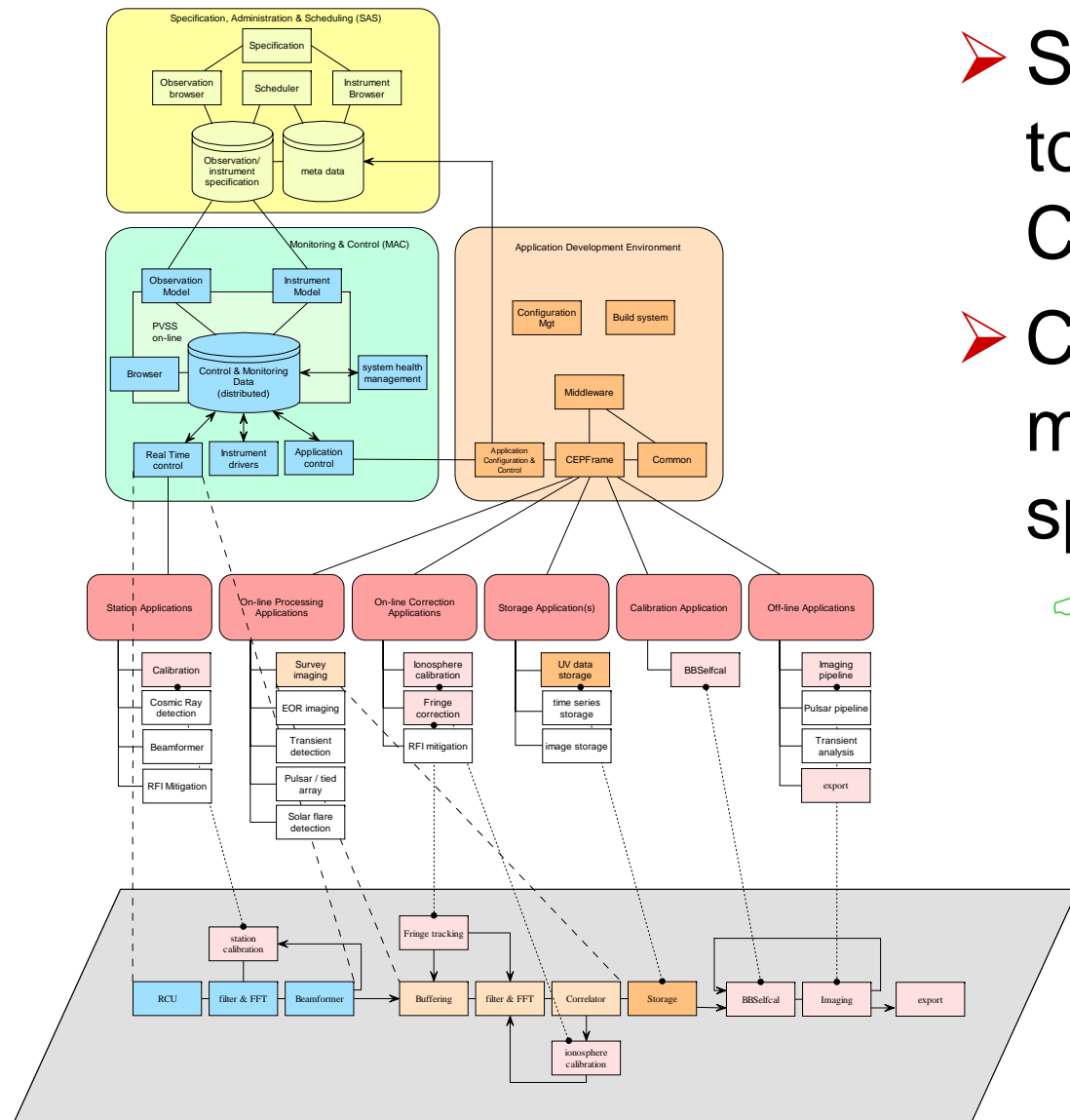
### ➤ Storage system

- ☞ Provides short term storage of observation data
- ☞ ~1 PByte with >100 Gbps I/O bandwidth

### ➤ Off-line cluster

- ☞ used for automated data product generation, including calibration
- ☞ Available for (interactive) user specific off-line analysis
- ☞ Fairly large: ~1000 Linux nodes

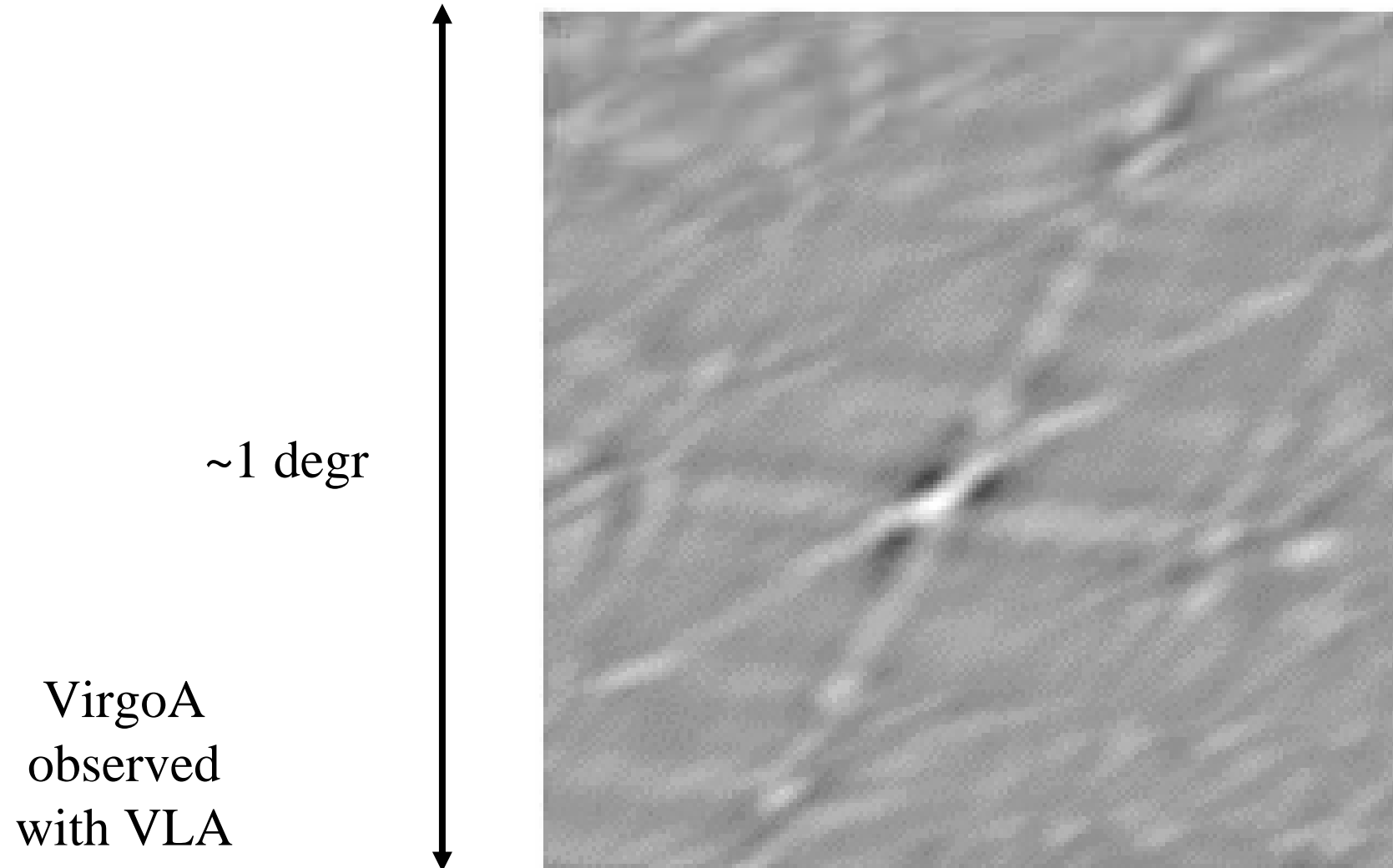
**Talk by Chris Broekema**

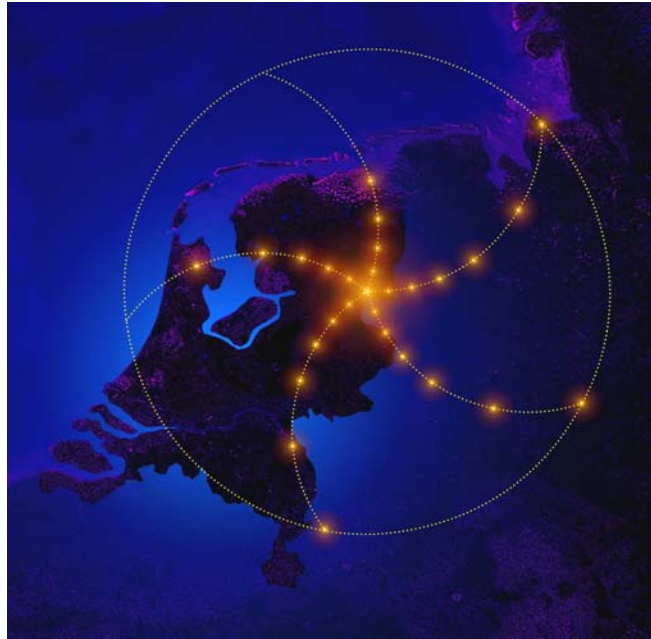


➤ SAS and MAC come together in CEPFrame pipelines

➤ Construct mode/observation specific pipelines

👉 With specialisations where needed





**LOFAR**



**Blue Gene inside**

[www.lofar.nl](http://www.lofar.nl)

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