



## International LOFAR Telescope Operations Meeting March 2010

ILTO 2010-03-23  
*Harm Munk*

# Agenda



- Introduction
- LOFAR Roll out status
- ILT Operations
- Station Maintenance
- (Wednesday 24/3) Visit to the LOFAR core

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## ■ Participants

Benedetta Ciardi	Garching/Unterweilenbach, DE
Leif Helldner	Onsala, SE
Enno Middelberg (EVO)	Jülich, DE
Artie Hatzes	Tautenburg, DE
Derek Mckay	Chilbolton, UK
Gottfried Mann	Potsdam, DE
Henrik Olofsson	Onsala, SE
Wolfgang Reich	Effelsberg, DE
Klaus Schlich	Effelsberg, DE
Annette Haas (EVO)	Tautenburg, DE
Harry Smith	Chilbolton, UK
Ralf Kisky	Effelsberg, DE
Ivan Thomas	Nancay, FR
Harm Munk	ASTRON, NL

# Purpose of the meeting



- Decide and define on operations structure and processes for the International LOFAR Telescope (ILT)
  - Form an operational ILT from
    - 9 owners owning 44 stations
    - connected through a network run by ~10 providers
    - data processed at the Centre for Information Technology of the Groningen University
    - data stored in Amsterdam, Groningen, and Jülich coordinated by ASTRON's Radio Observatory
  - Maintain the ILT components

(...for the first observing `semester`...)

- Discuss station construction, exchange experience

# Introducing the ILT



- The ILT aims to maximise the scientific productivity of LOFAR
- ILT Founders: LOFAR astronomy consortia in France, Germany, the Netherlands, Sweden, the United Kingdom, and ASTRON
- resources for operations made available for integrated operations in the ILT
  - Science support: astronomers, system engineers
  - Technical operations

Resources ASTRON (Radio Observatory) provides:

- Science support
- Technical Operations

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# Timeline



- Construction started in 2008
- Station construction started in 2009
- Official opening: June 12, 2010 (81 days)
- Commissioning observing already started







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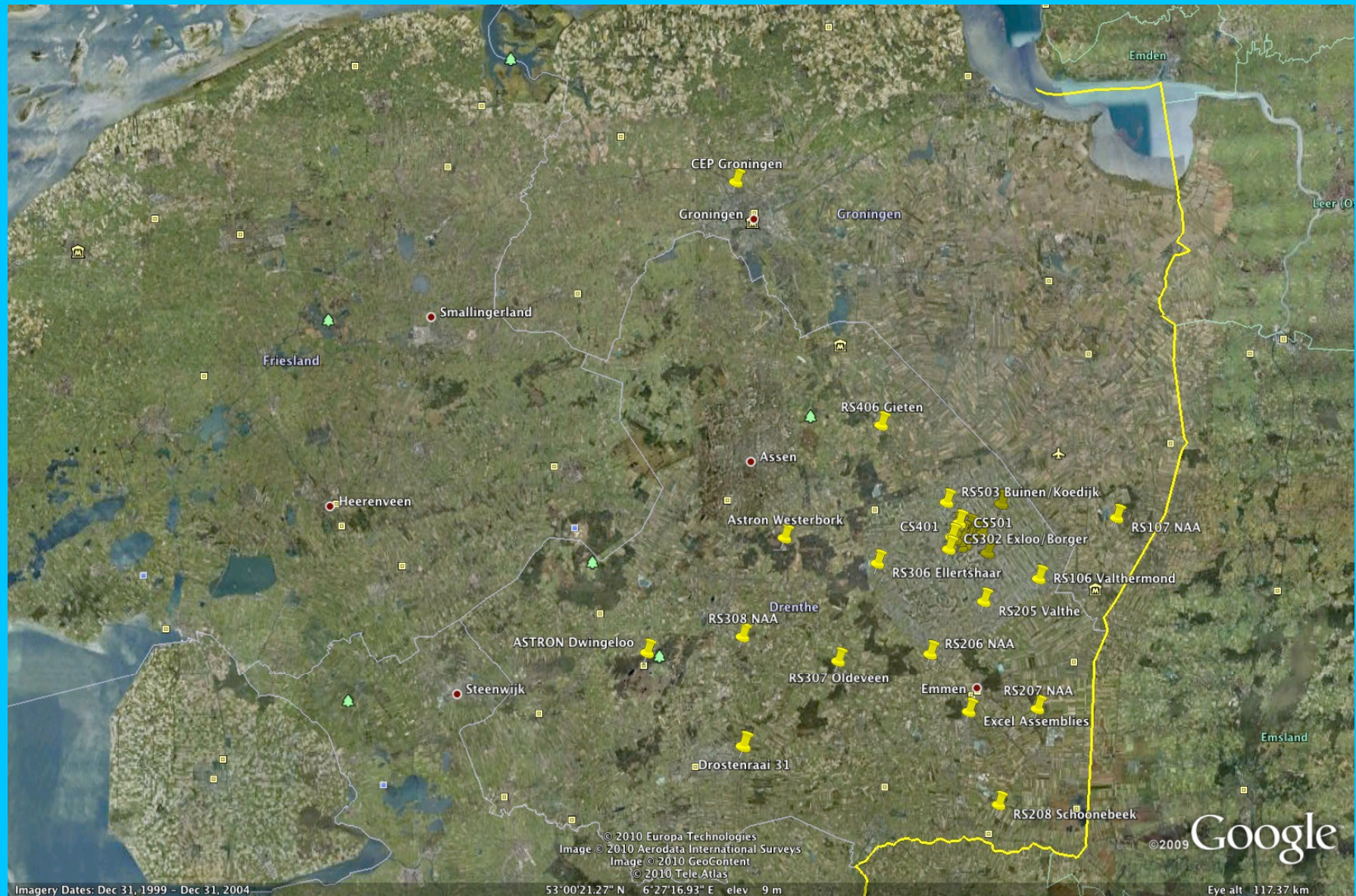
# LOFAR from above



# LOFAR from above



# LOFAR from above



# Station construction: The Netherlands



<b>Station type</b>	<b>LBA</b>	<b>HBA</b>
Core (CS): 20	17	16 1/2
Remote (RS): 16	7	7
International: 8	4	2

- CS: 96 LBA            2x24=48 HBA
- RS: 96 LBA            1x48 HBA
- IS: 96 LBA            1x96 HBA (+1 dummy)

# LOFAR: 'Superterp', station construction



- No construction at the moment (poor conditions)

# International Station Construction



<b>Country</b>	<b>Location</b>	<b>Status</b>
France	Nancay	LBA finished
Germany	Effelsberg	Finished
	Garching/Unterweilenbach	LBA finished, HBA to be constructed
	Jülich	To be constructed
	Potsdam	LBA finished, HBA to be constructed
	Tautenburg	Finished
Sweden	Onsala	To be constructed
U.K.	Chilbolton	Under construction



# International Station construction



- Nancay
- Effelsberg
- Garching/Unterweilenbach
- Jülich
- Potsdam
- Tautenburg
- Onsala
- Chilbolton

# Discussion on station construction



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# LOFAR components



## ▪HW Components

- Stations
- Networks
- CEP
  - BG/P
  - Storage nodes
  - Compute nodes
- Long term archive

## ▪SW Components

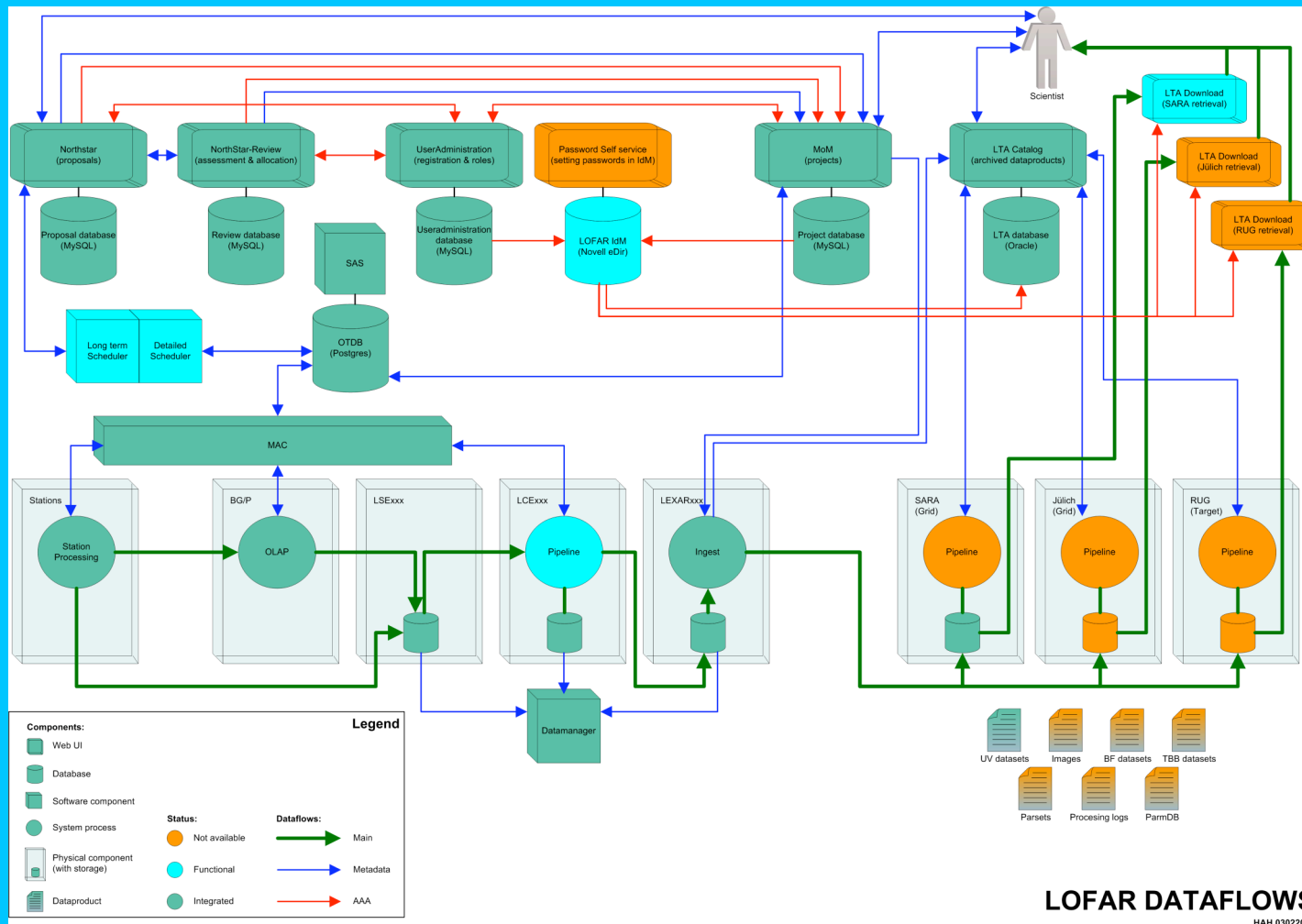
- Station software
  - MAC
  - Signal processing
- CEP
  - On-line software
  - Storage nodes
  - Off-line software
    - Imaging pipeline
    - Pulsar pipeline
    - Cosmic-ray pipeline
    - Solar and space weather pipeline

## ▪System SW components

- NorthStar (proposals)
- SAS, Scheduler, MoM
- SHM
- CRAFT
- LTA maintainer

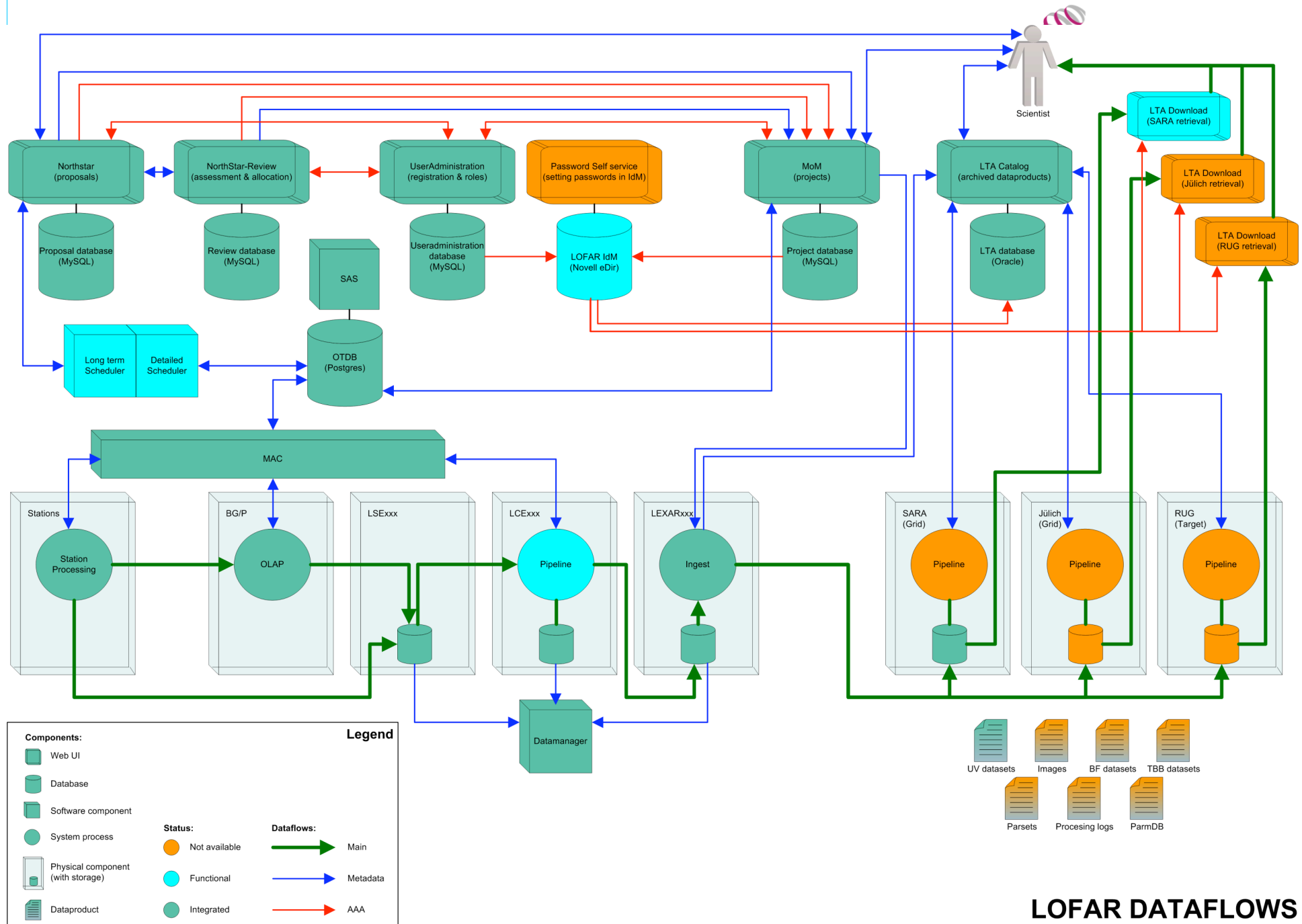


# System Structure



LOFAR DATAFLOWS

HAH 03022010



# LOFAR DATAFLOWS

HAH 03022010

# Radio Observatory Control Room



# Operating LOFAR



- Schedule constraints:
  - 10% maintenance time (16 hrs/week)
  - 90% observing time:
    - 90% (=81% of total time) for array observations
    - 10% (=9% of total time) for private local use
      - For efficiency: all stations at the same time
    - Handover process:
      - Station control is always given away, never taken away
    - Target of Opportunity
  - In case of no ILT usage: private use (on top of 10%)
  
- Array mode: station is part of the ILT
- Stand alone mode: station is under local control



# Schedule process



- Observation proposals entered/handled through NorthStar
  - Two calls per year
  - LOFAR Programme Committee
- 1<sup>st</sup> stage scheduling: whole semester
  - Observational constraints (rise-set times, day-night observations)
  - Maintenance constraints
- 2<sup>nd</sup> stage scheduling: 1-3 weeks period (adjustable)
  - All of the above, plus
  - telescope status, WAN status, CEP status, LTA status

# Schedule process, operations



- Daily scheduling: deal with
  - Station problems
    - Contact person at/for station
  - Network problems
    - Contact person at network provider
      - NL: ASTRON (last mile) , Ziggo (RS-Core), KPN (Core-CEP), SURFNET (Dutch border-CEP)
      - FR:
      - DE: DFN, but who deals with local network
      - SE:
      - UK:
  - CEP problems :
    - ASTRON, Contact person at CIT
  - LTA problems :
    - CIT: Contact person at CIT
    - SARA: Contact person at SARA
    - Jülich: Contact person at Jülich

# Operations communications



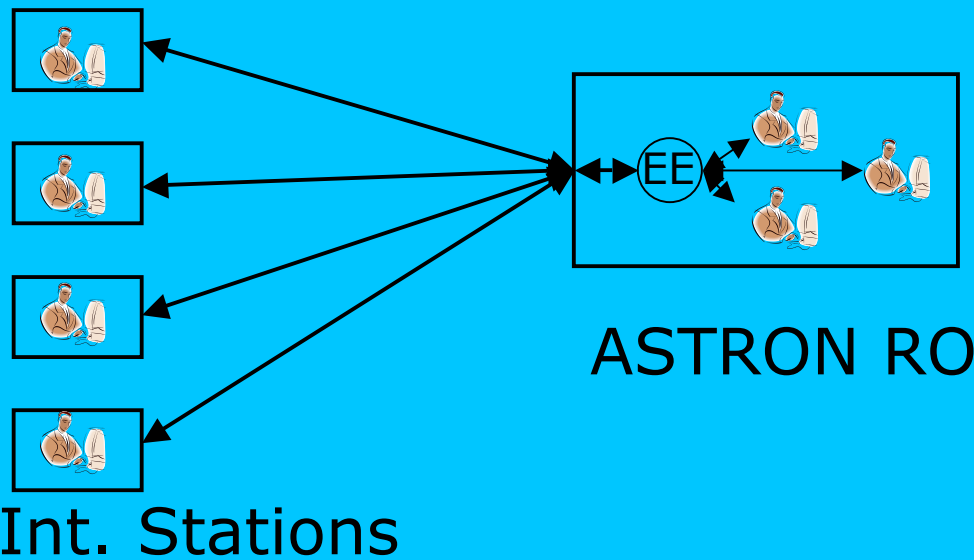
## ASTRON RO:

- On call Monday-Friday: office hours
- Weekends: monitoring
- Same for
  - International stations
    - Nancy
    - Effelsberg
    - Garching/Unterweilenbach
    - Jülich
    - Potsdam
    - Tautenburg
    - Onsala
    - Chilbolton
  - Network
  - CEP
  - LTA

Discuss operational status at weekly telephone conference

# Email, phone

- One phone number, if possible
- Use email 'exploder' ('Majordomo')
- Wiki forum?



# ILT Monitoring



- Currently only available at ASTRON Control Room
- Several options:
  - VPN access
    - Experimental status of sw components
    - Network security
  - Separate international stations monitoring system (read only)
    - Effort required
- Local station access
  - Limited view
  - Current sw requires rework

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# Station Acceptance



- Includes station validation report
  - Includes station calibration
- >station quality level at acceptance

# Maintaining LOFAR



- Division of responsibilities between local station owner and ASTRON

## ASTRON

- Software
- Firmware
- Upgrades

## station owner

(0.25 FTE estimated)

- Hardware
  - Antennas
  - Equipment container
  - Cabling
    - Coax
    - Power
    - Network

Support by ASTRON

- Terrain maintenance, security
  - (subcontractors)



# Preventive and corrective station maintenance



Based on

- SHM
- Tests
  - Being developed, based on experience from constructing LOFAR
- Observation reports
- Experience (gained)
- System errors
- Local inspection
  - Damage caused by animals, weather, vandalism

# Spare parts



- Stored at ASTRON (5%), send on demand
- Stored locally
  - Critical components
  - Frequently malfunctioning components
- Send broken parts back to ASTRON (cause analysis, repair)

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# Keeping in touch



- Parties involved:
  - ASTRON RO
  - International Station owners
  - CEP, WAN, LTA representatives
  
- Daily: (operational status)
  - Phone
  - Email
  - IRC (Skype, ?)
  - (Wiki) Forums?
  
- Weekly: (operational status, short term planning)
  - Telephone conference
  
- Once per semester: (operational processes)
  - Meeting (as today's meeting)