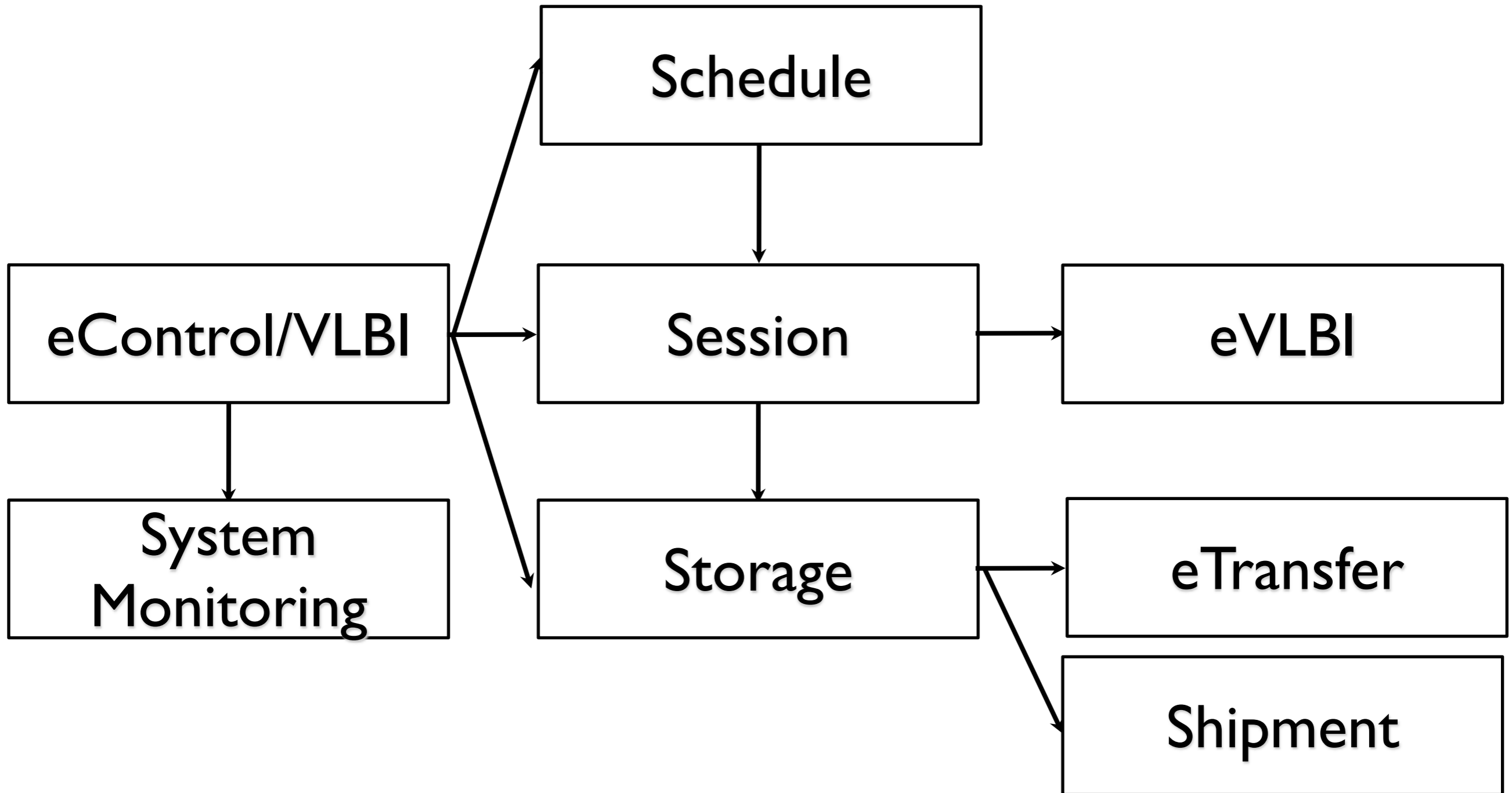


# Communication Requirements: GGOS

First Round Draft

U. Schreiber / A. Neidhardt

# VLBI



# VLBI observation strategies

Local  
Observation

Remote  
Observation

Shared  
Observation

Unattended  
Observation



Internet



Internet



# eControl/VLBI

```
graph TD; A[eControl/VLBI] --> B[Shared Obs.]; A --> C[Remote Crtl. Obs.]; A --> D[Unattended Obs.]
```

## Shared Obs.

- Passive data access (live monitoring)
- Controlling for operators and scientists
- Future operation styles which share operations between observatories and coordinate them (centers share responsibilities for several controlled telescopes)
- Reduce workload during night shifts for highly utilized telescopes

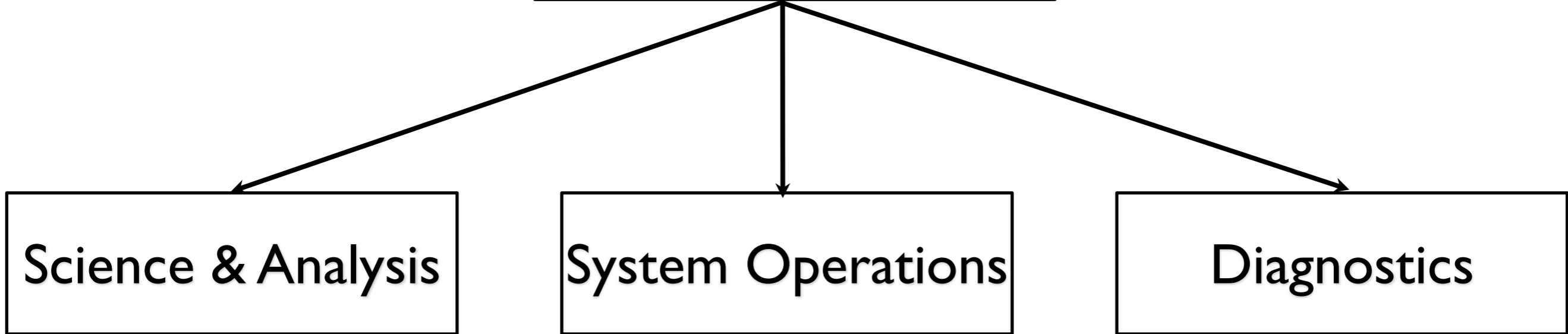
## Remote Crtl. Obs.

- Check system states from all over the observatory
- Tele-working to attend or check (unattended) observations during weekends
- Remote assistance for operators by a remote specialist
- Control very remote telescopes (like in Antarctica) to assist the local operators

## Unattended Obs.

- Observations run completely autonomous and automatic without operators

# System Monitoring VLBI

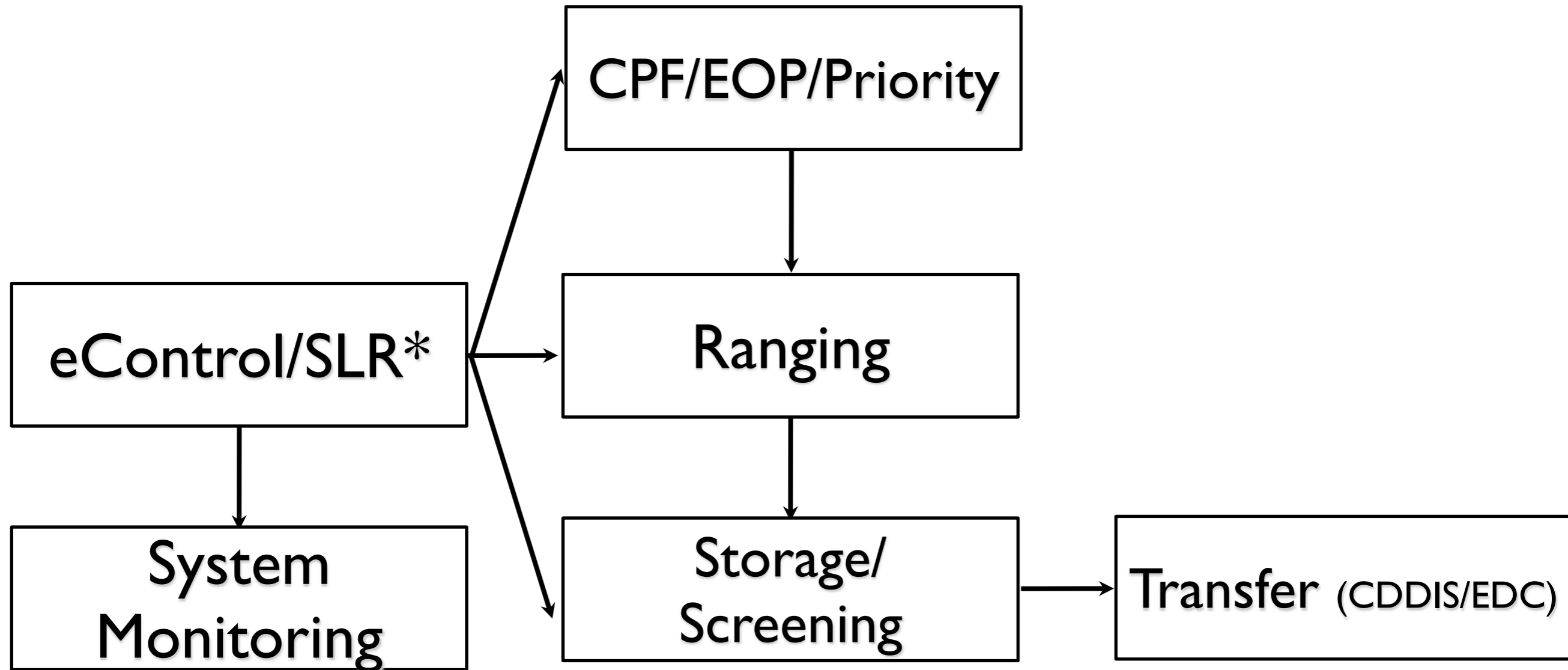


Meteorology  
Strain  
WV-Radiometer  
Analysis relevant system  
Parameter

Operational parameter, as  
system temperatures, power  
supply, wind loads, rack  
temperatures, etc.

System diagnosis possibilities,  
e.g. servo power current with  
high sampling rates

# SLR



\* eControl design modeled after the VLBI eControl

# eControl/SLR

```
graph TD; A[eControl/SLR] --> B[Shared Obs.]; A --> C[Remote Crtl. Obs.]; A --> D[Unattended Obs.]
```

## Shared Obs.

- Maybe coordinated observations of GNSS and other satellites
- Go/NoGo and restricted observations with standardized real-time access
- Special combined observation projects for time transfer and feedback etc.

## Remote Crtl. Obs.

- Check system states from all over the observatory
- Tele-working to attend or check (unattended) observations during weekends
- Remote assistance for operators by a remote specialist
- Control very remote telescopes (like in Antarctica) to assist the local operators

## Unattended Obs.

- Semi-automated observations (restrictions of flight safety apply)

# Monitoring/SLR

```
graph TD; A[Monitoring/SLR] --> B[Science & Analysis]; A --> C[System Operations]; A --> D[Diagnostics];
```

## Science & Analysis

Meteorology  
Clock Offsets  
System Parameter

## System Operations

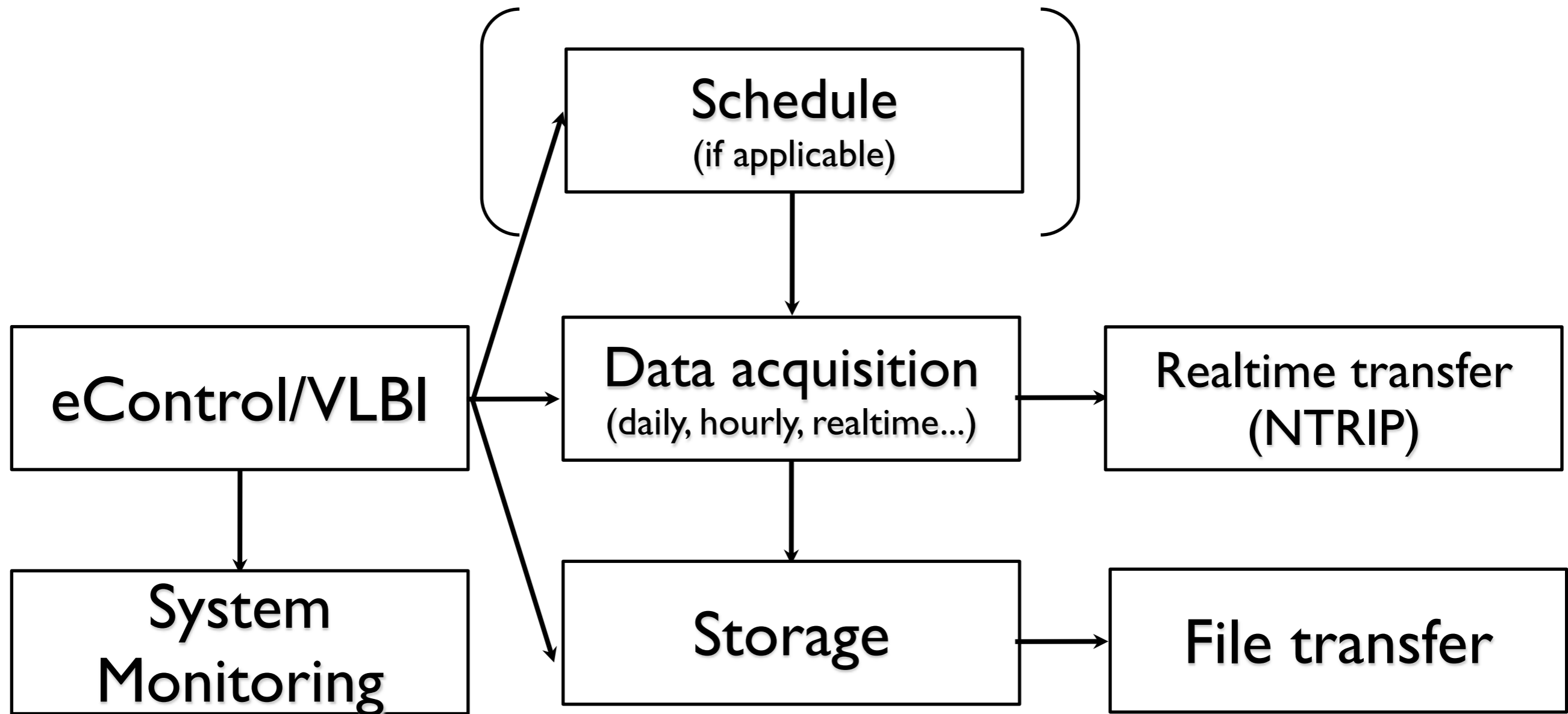
Rain Detector  
Cloud Coverage  
Aircraft Safety  
Telescope Status  
Laser Status  
Sun Avoidance  
Go/No-Go Flag  
Human safety detectors  
Laser Power  
System Temperatures etc.

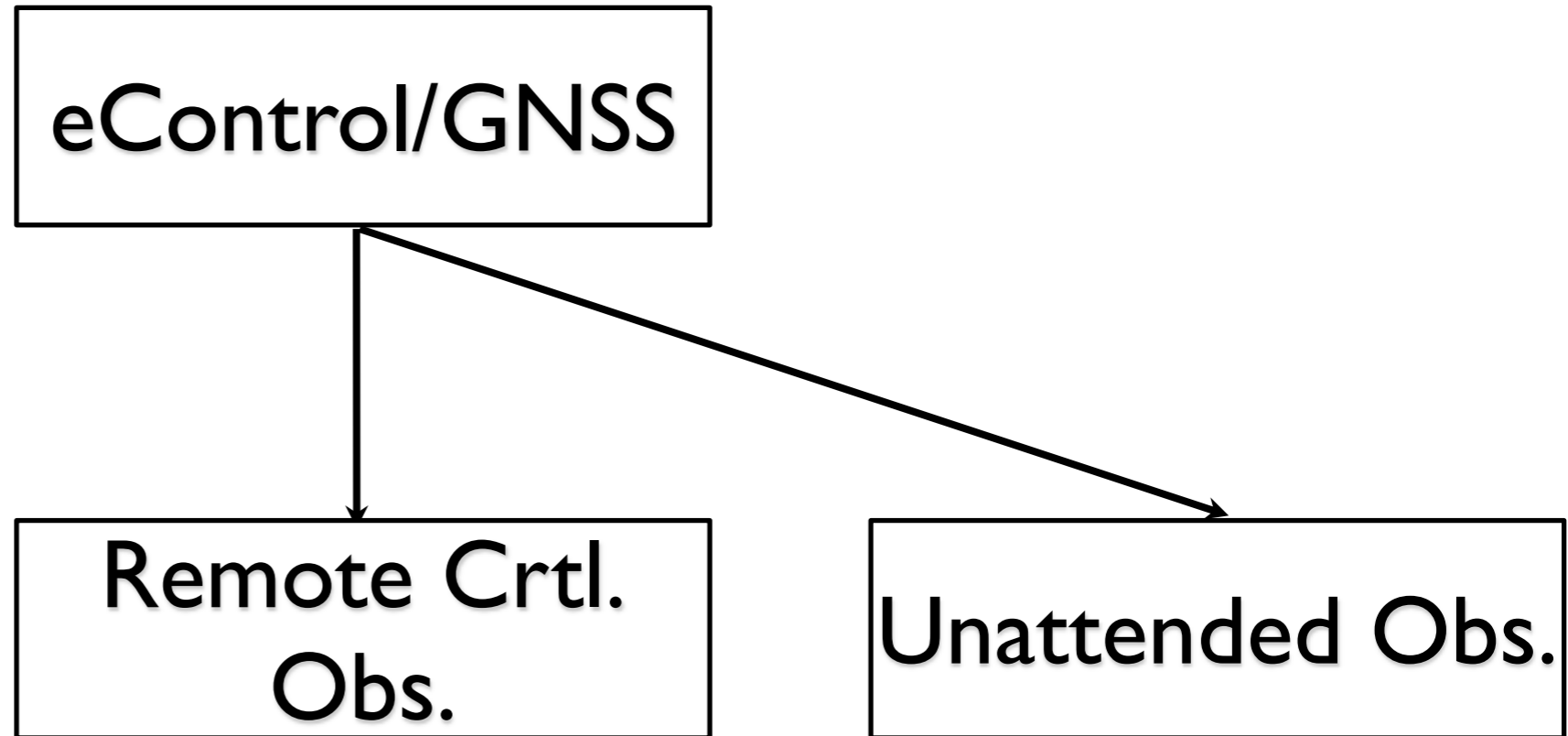
## Diagnostics

Calibration Stability analysis  
Laser Power analysis  
Noise Level  
Analysis for Special Mission  
Needs  
(LRO etc.)



# GNSS





Check station integrity:  
coordinates/position  
Active/inactive/corrupt data stream  
Rinex header <-> site log file  
data completeness

Run software updates:  
Operating system  
User system

Check and set parameters:  
Configuration  
Rinex Header

Standard mode for GNSS  
permanent sites

# Monitoring/GNSS

## Science & Analysis

Meteorology  
WV-Radiometer  
System Parameter

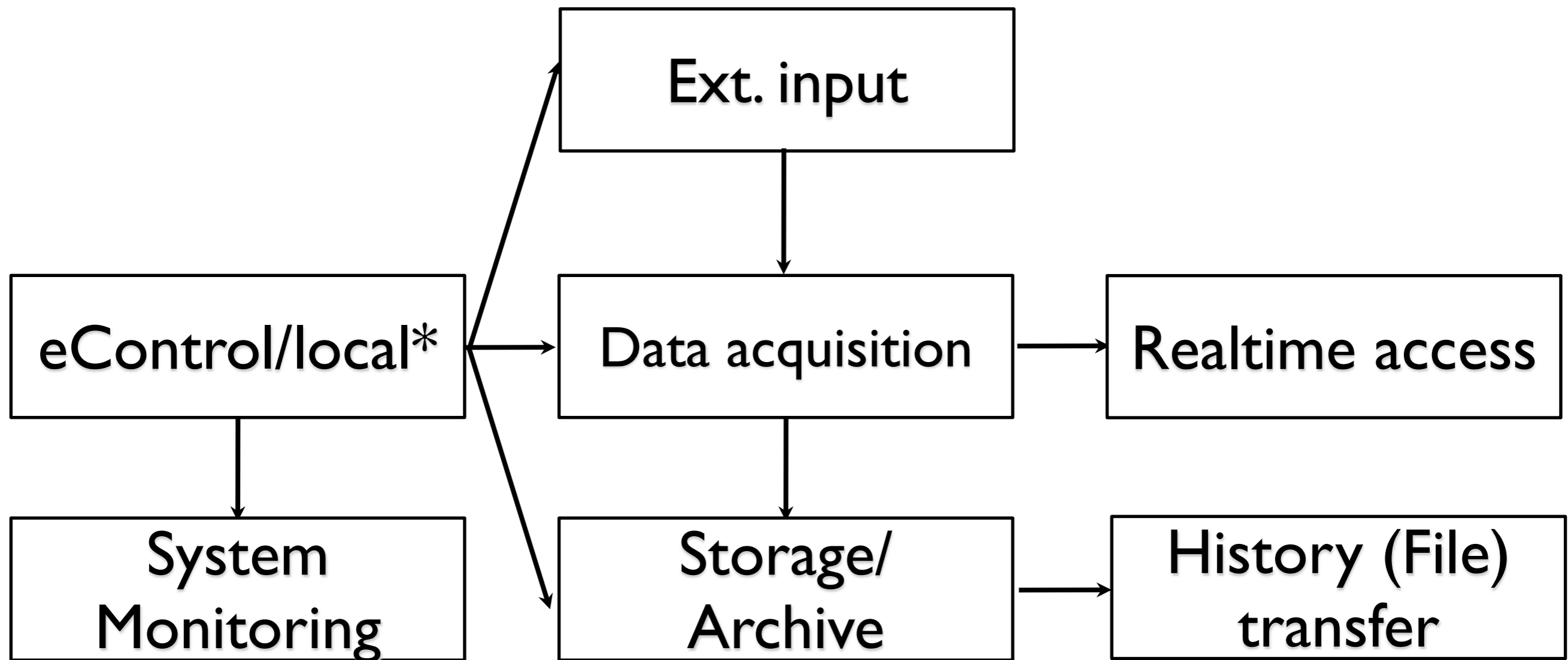
## System State

Coordinates/position  
Active/inactive/corrupt data stream  
Rinex Header <-> site log file  
data completeness + integrity  
Loss of lock  
external clock  
memory space  
Almanach update  
All in view tracking  
electrical power supply state

## Diagnostics

Coordinates/position  
data stream  
Rinex Header  
hourly/daily data

# Local permanent Sensors: Seismo, Hydro, Meteo, Gravimetry, Ring Laser



\* eControl design modeled after the VLBI eControl

Monitoring/Local

Science & Analysis

System Operations

Diagnostics

Timeseries of local  
Measurement Quantities

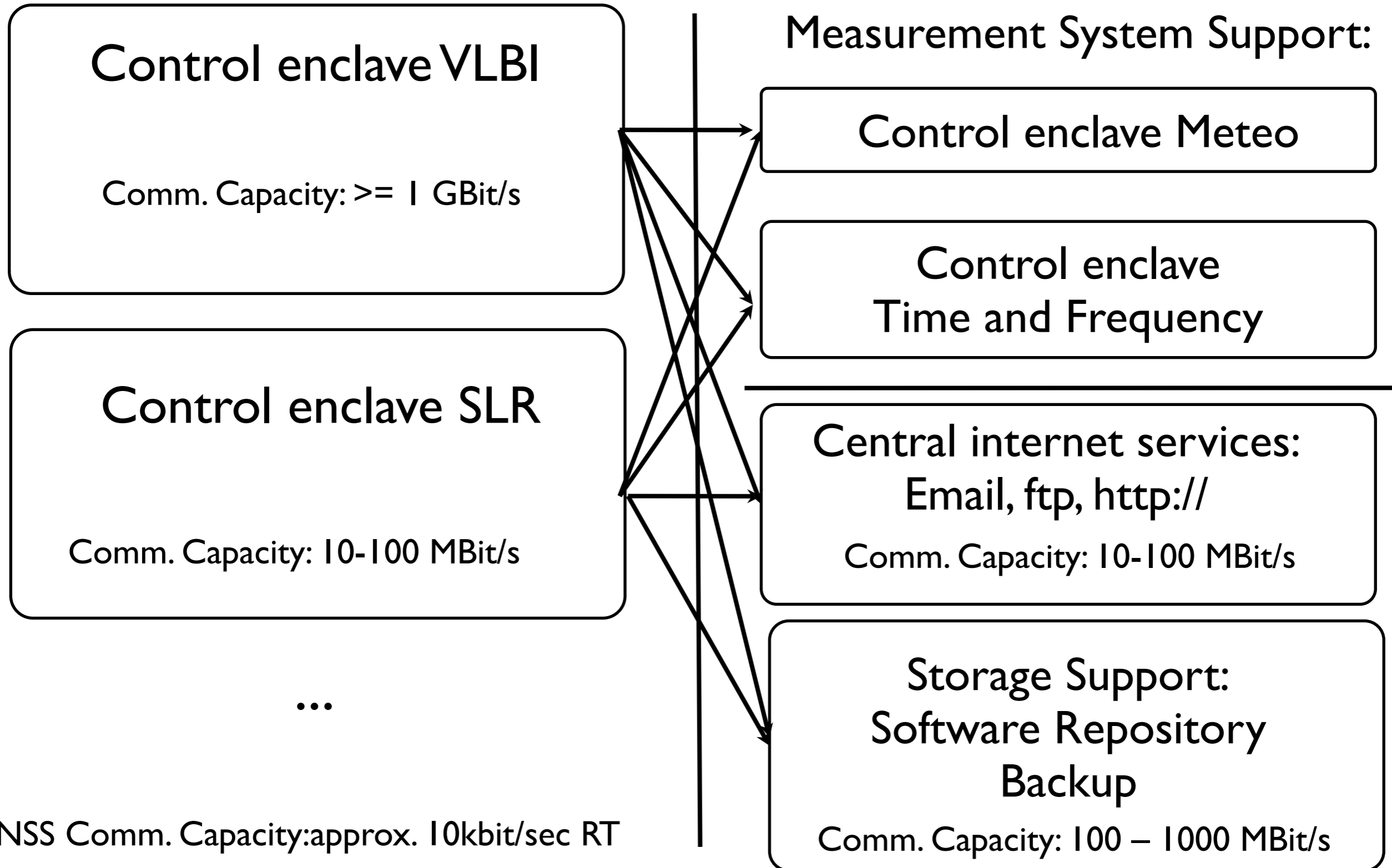
Parameter of the  
various Subsystems

System Health  
Feedback Loop Control

Ancillary System Data  
Consistency of Datasets

# General Infrastructure

local system zones (control enclaves) with separate firewalls



GNSS Comm. Capacity: approx. 10kbit/sec RT