Federal Agency for
Cartography and Geodesy

The status of WLRS system automation

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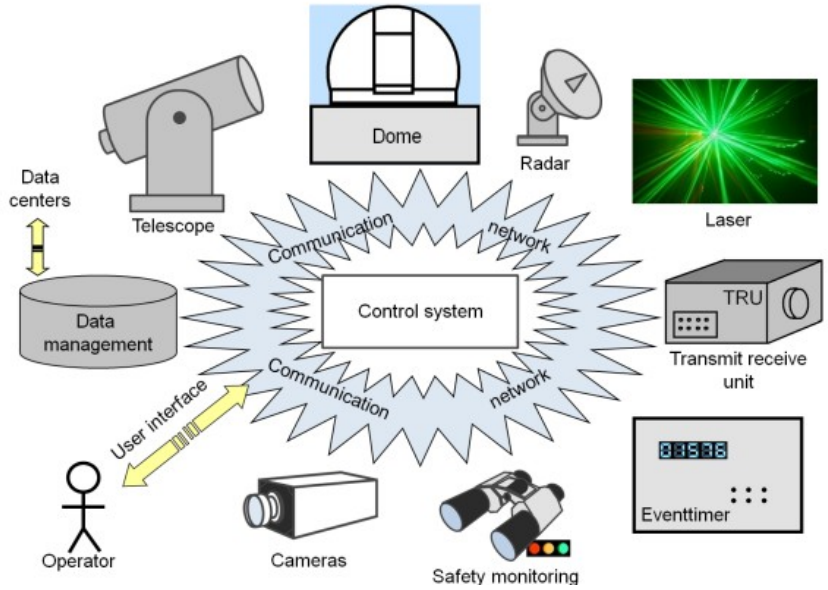
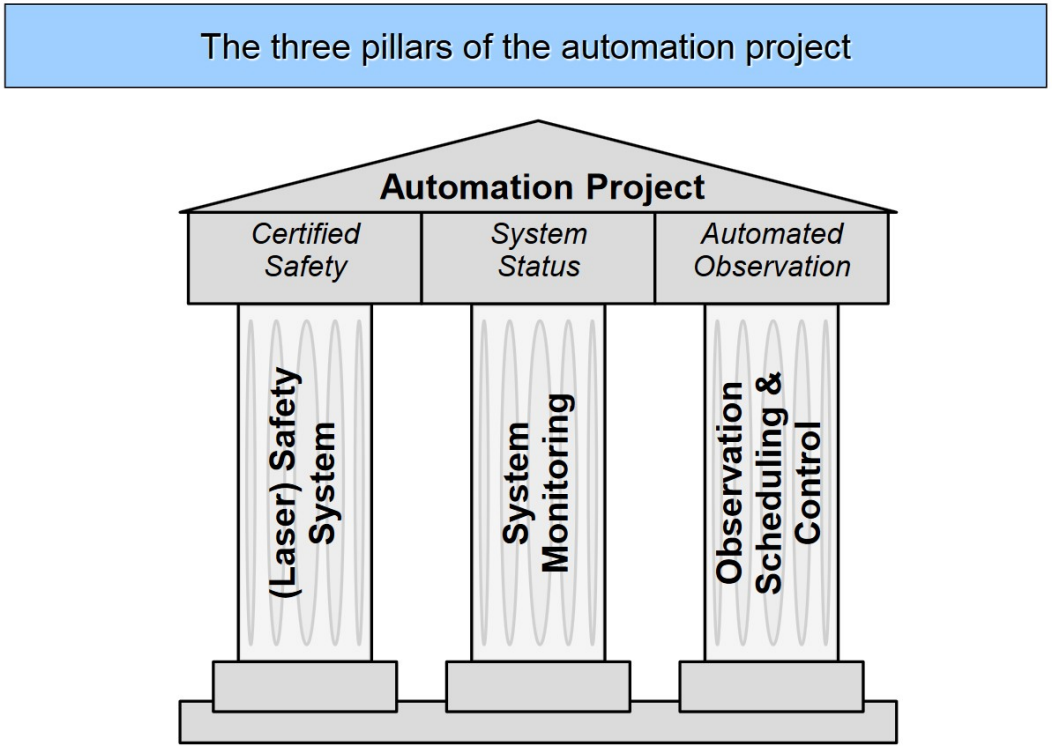
Basics

Basic tools for sustainable software development and to ensure minimum requirements to functional safety:

- Version control: **Apache Subversion**
- Software documentation: **Doxygen**
- Software quality control: **Cppcheck**
- General documentation: **Dokuwiki**
- System-Monitoring:
  Zabbix, Grafana &
  Wettzell SysMon
- Communication interface:
  Idl2rpc.pl (A. Neidhardt),
  Generator for client-server
  architecture



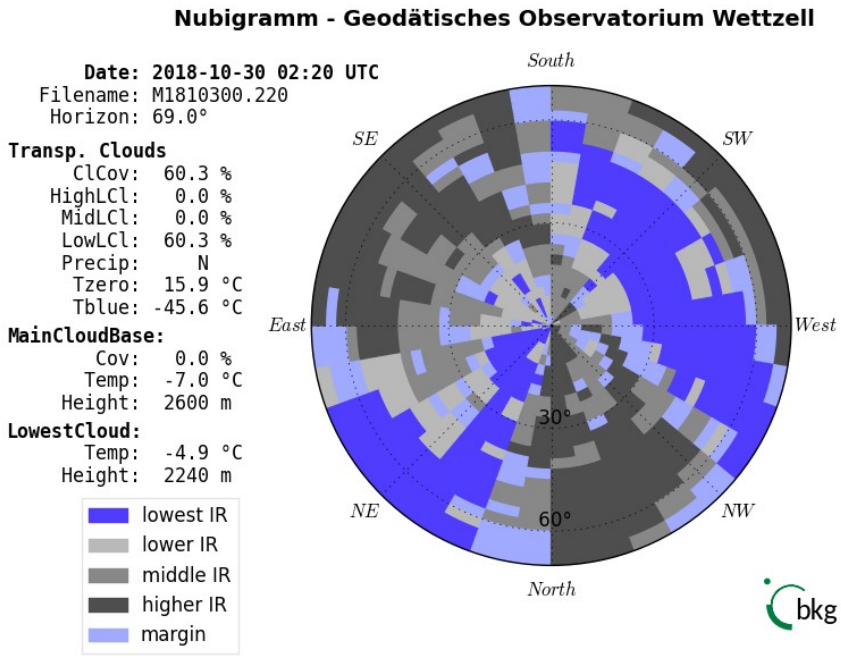
Concept



- Besides, Hardware:
  - Sensors for atmosphere
  - Increase repetition rate of WLRS (Session 9 presentation)

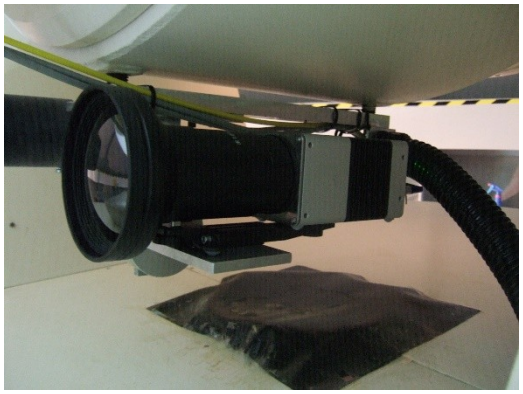
Sensors
- cloud position & rain -

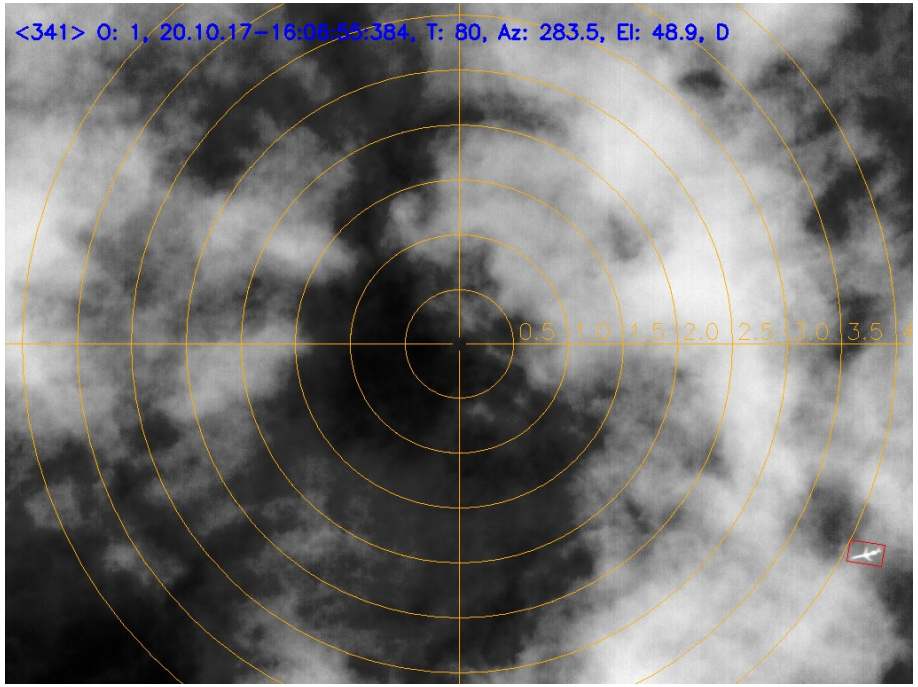
- **NubiScope**:
  - Skymap with IR-senor @ 10 min interval
  - Resolution: 10 degree Azimuth, 3 degree elevation
  - Precipitation indicator



Sensors
- cloud & rain -

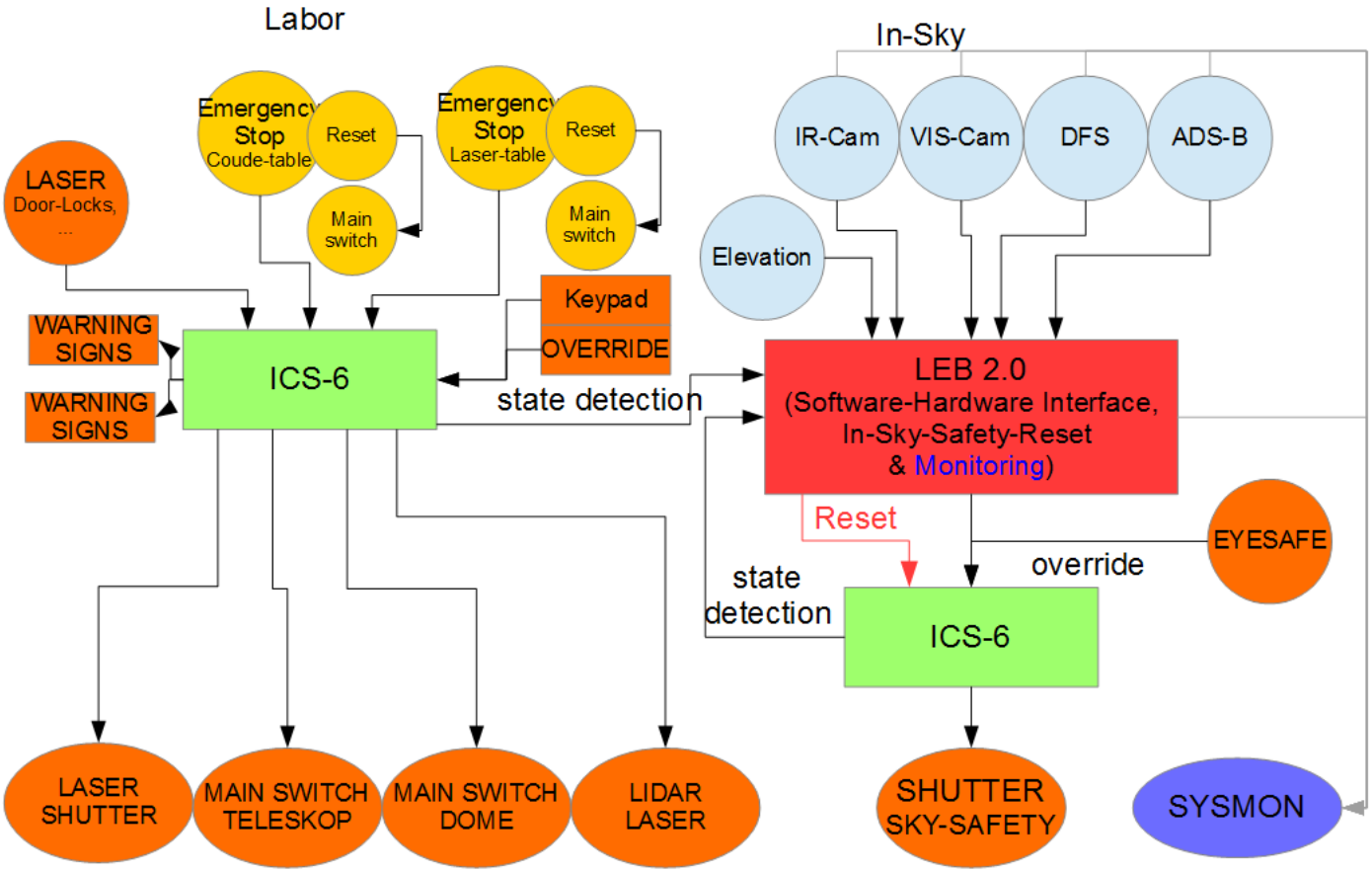
- **InfraTec**: Heat sensing camera for cloud detection during observation (part of In-Sky-Safety system → poster, board 23)
- **Thies**: Optical rain sensor to shut the system down





Safety System
- overview -

- Two independent circuits (Lab & In-Sky-Safety)

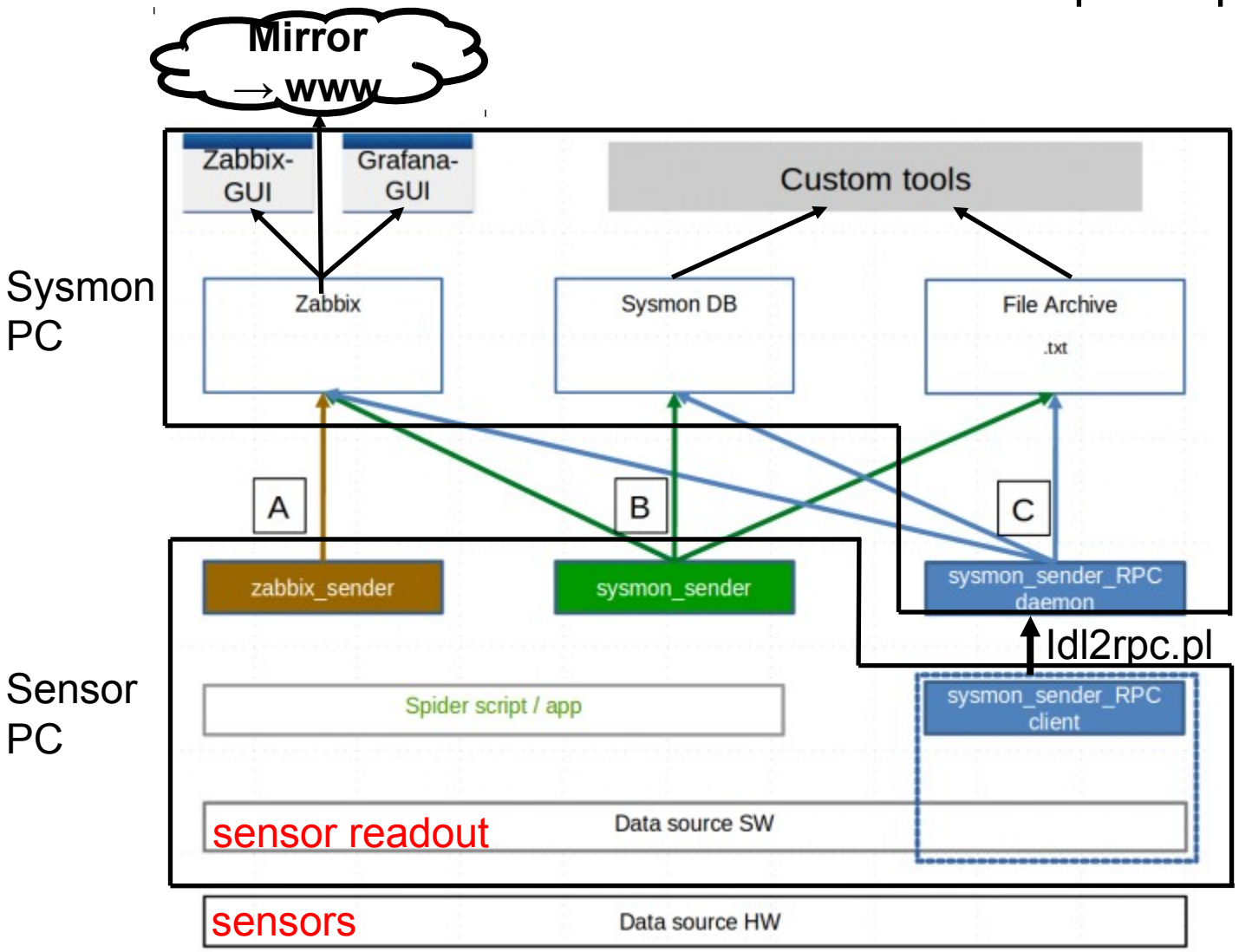


Safety
- components -

- **Lasermet**: Laser Safety System
  - EN ISO → 13849-1 performance level e
  - EN61508 → SIL 3
  - Dual blade shutter

- Installation planned during major system overhaul 2019

System-Monitoring
- principle -



Choose either A, B or C to insert data to Sysmon

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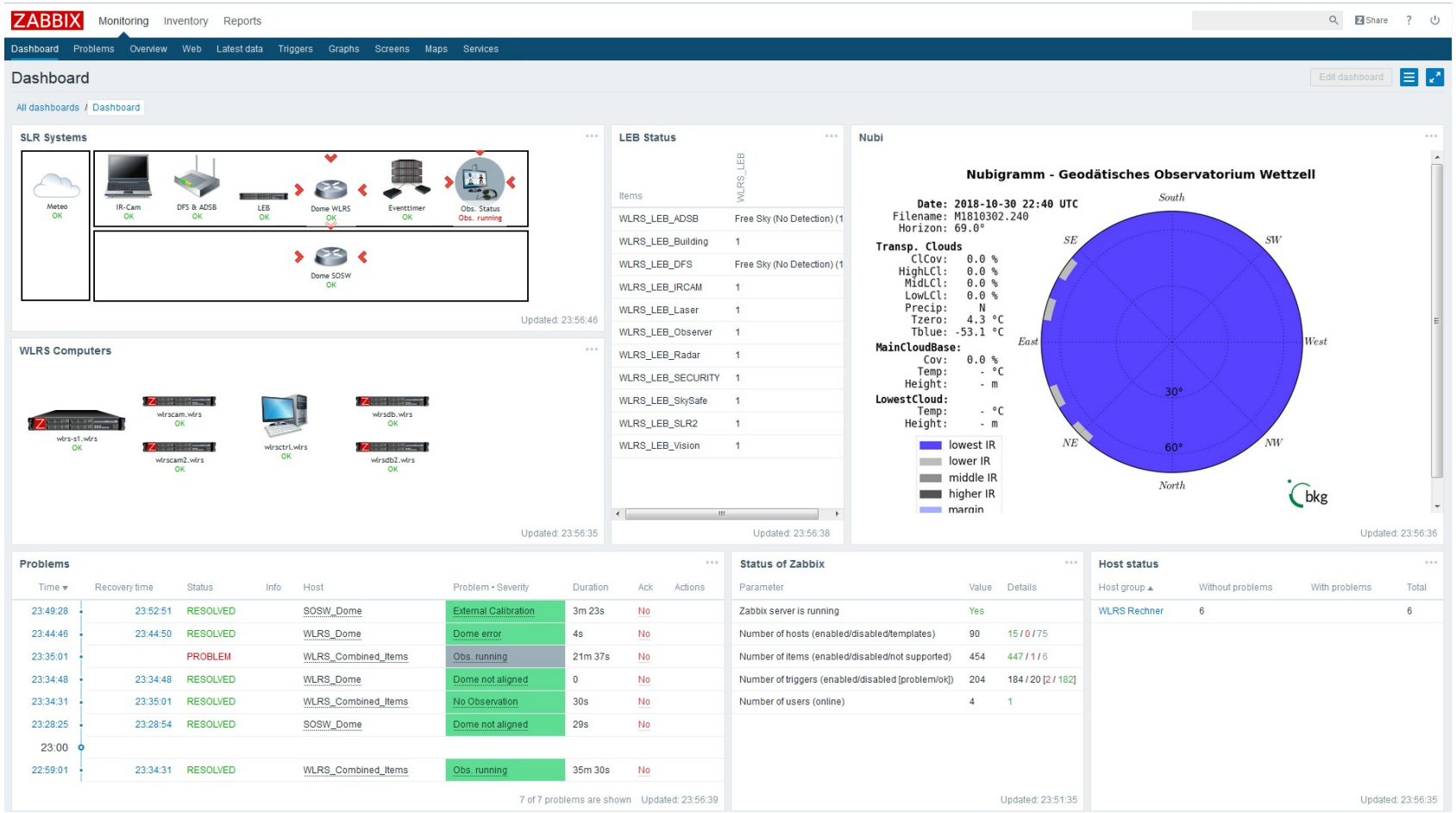
System-Monitoring - main page -



System-Monitoring
- example Grafana -

Scheduling & Control
- Controller design -

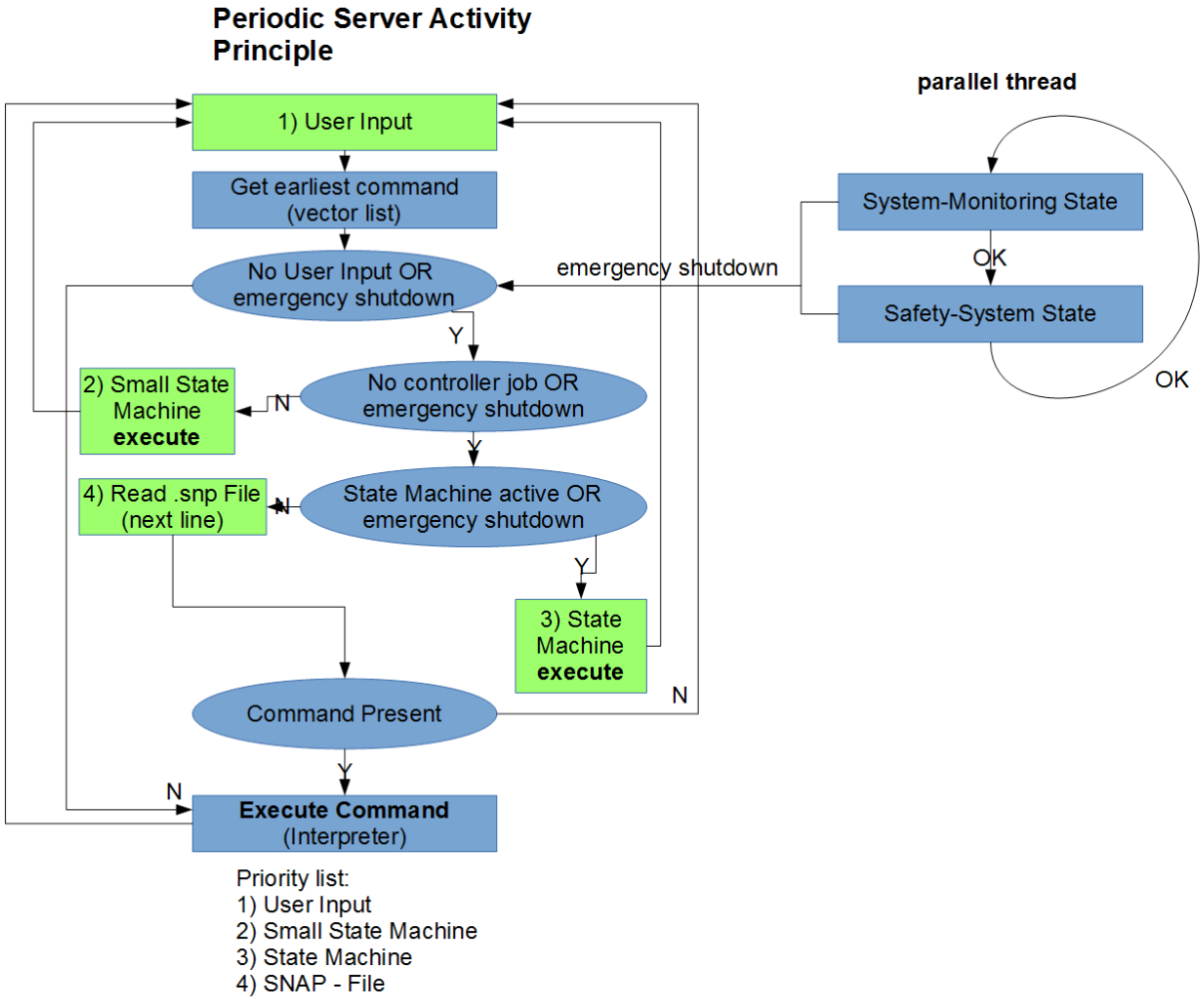
Features:

- Central configuration file distributed to each device
- System control based on SNAP commands (VLBI)
- Mission dependent SNAP-files possible
- State Machine for optimization during observation (pending)

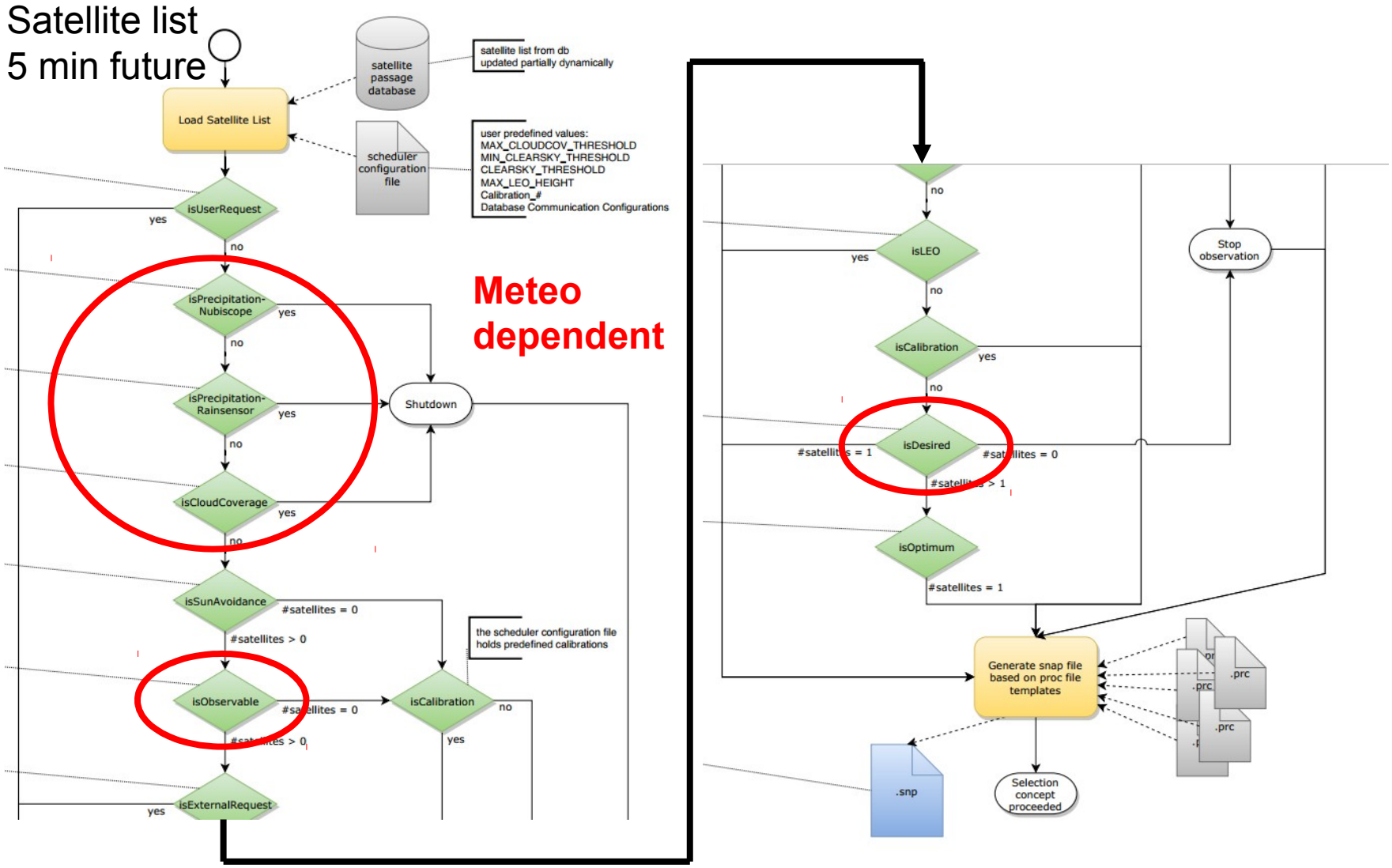
CALIBRATION

1. **EUROLAS**=usSet?=CAL
2. **SLRET**=usSetCalibration=… #PPS & channeloffset
3. **SLRET**=usStartMeasurement
4. **TRU_OWIS**=usSet??? #divergence, fov, aperture, nd wheels
5. **TRU_OWIS**=usMove2Reference
6. **CONTROLLER**=usSetAzEl=… #moves telescope & waits until coordinates reached
7. **CONTROLLER**=usSetAzEl=… #moves telescope once more (if required)
8. **CONTROLLER**=usCheckCalFinished #reads SLRET usisvalid until != 0
9. **CONTROLLER**=usCheckTRU_OWIS #reads TRU_OWIS parameters until position reached
10. **SLRET**=usSetCalibration=… #set calparameters
11. **SLRET**=usSetLaserDelay=100000
12. **SLRET**=usStartMeasurement
13. **CONTROLLER**=usAdjustSignalLevel=%RR #moves TRU_OWIS until signal level is proper
14. **CONTROLLER**=usCheckCalFinished
15. **SLRET**=usSetLaserDelay=0
16. **CONTROLLER**=usSetAzEl=… #move the telescope, if required
17. **SLRET**=usSendCal2DB
18. **Scheduler**=usGetJob

Scheduling & Control
- Controller main loop -



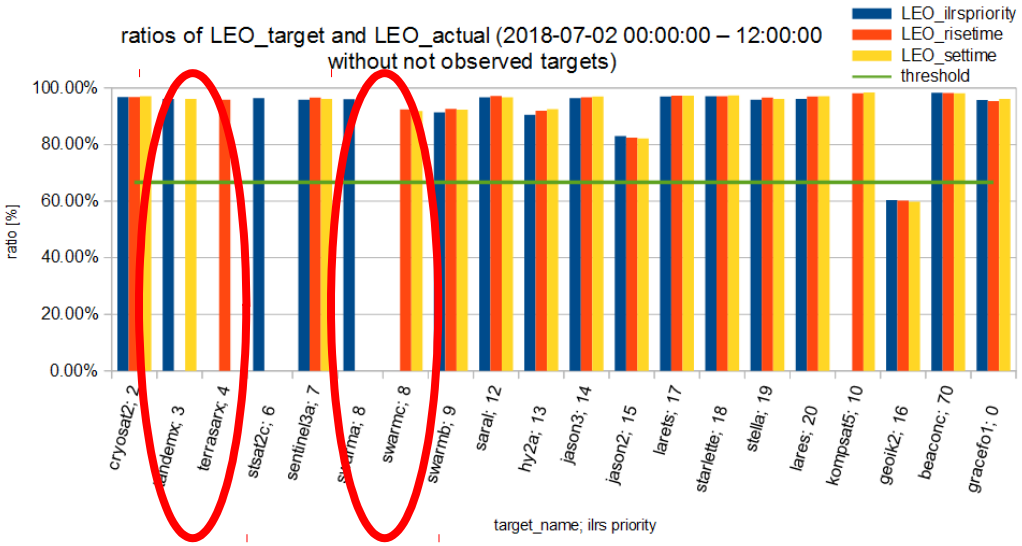
Scheduling & Control
- Scheduler selection plan -



Scheduling & Control - Scheduler results -

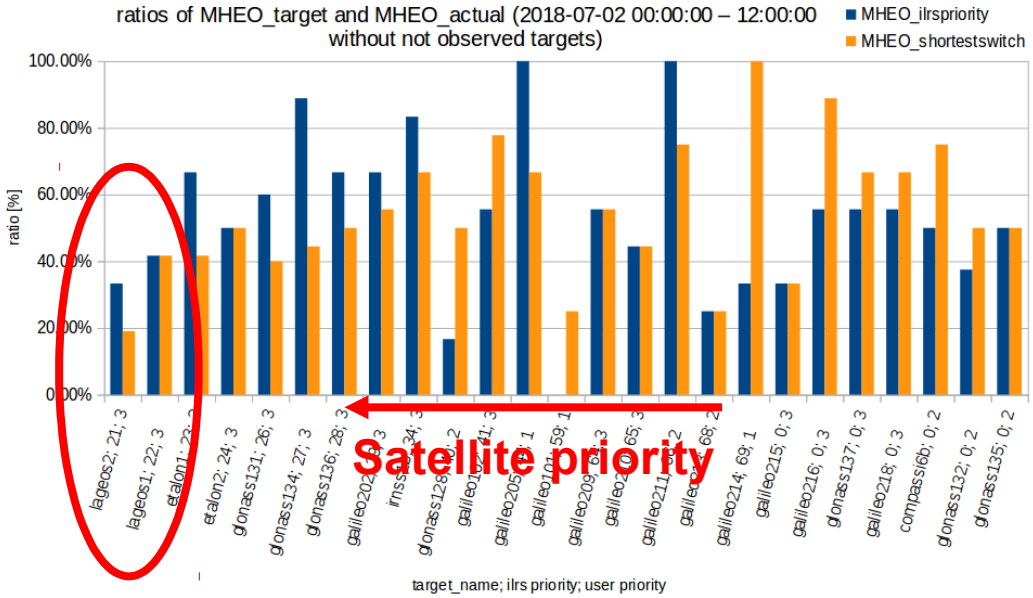
LEO:

No inter-leaving



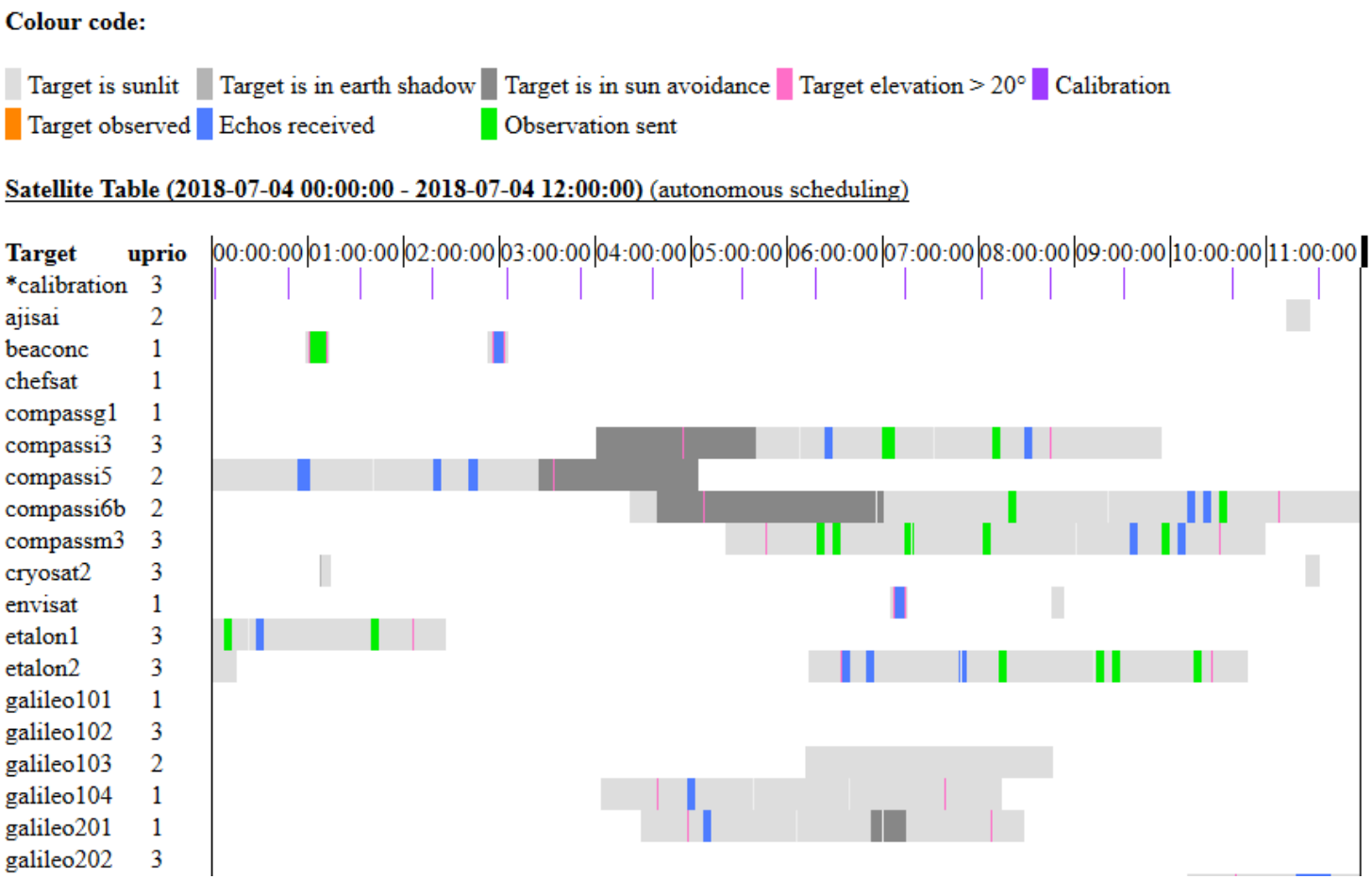
HEO:

Short visibility



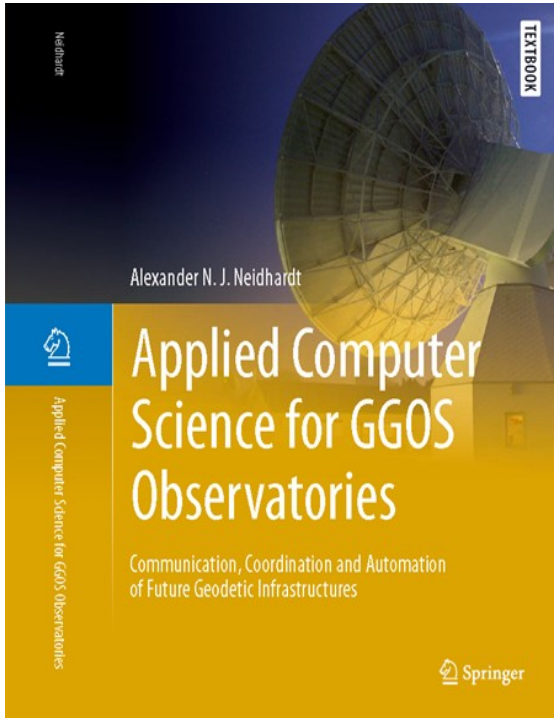
Scheduling & Control
- quality control -

- Scheduler & Controller in simulation-mode



Conclusion

- System automation of WLRS is in advanced state
- System integration tests planned in early 2019
- Autonomous operation still challenging
- Major system upgrade planned for mid 2019 to gain CE conformity and to improve safety-standard and documentation



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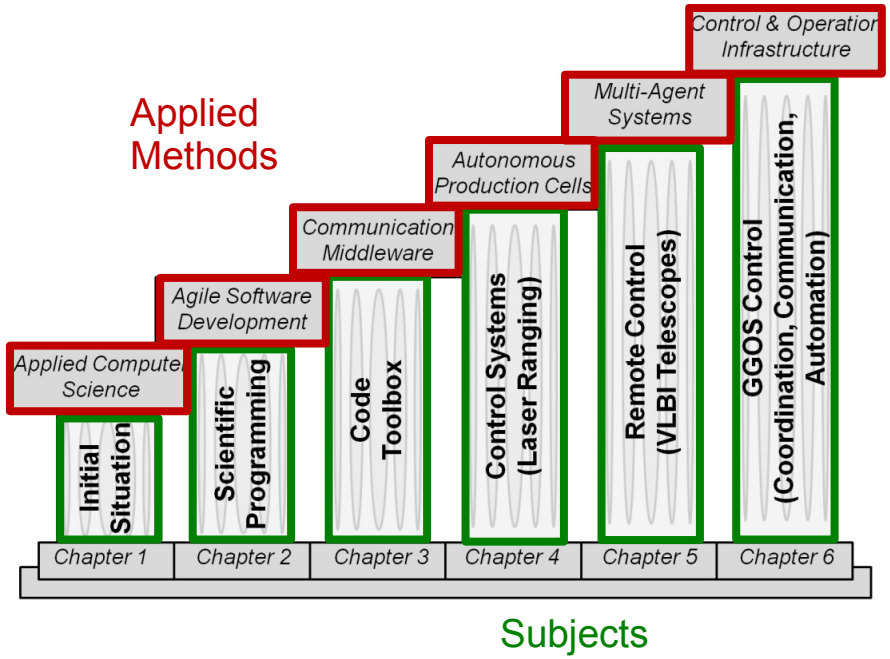

This book combines elementary theory from computer science with real-world challenges in global geodetic observation, based on examples from the Geodetic Observatory Wettzell, Germany. It is a guide for students, staff and development engineers.

Bookmetrix

2018, Oct. 31st

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Compared to Plag/Pearlman "Global Geodetic Observing System" (2009)

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