



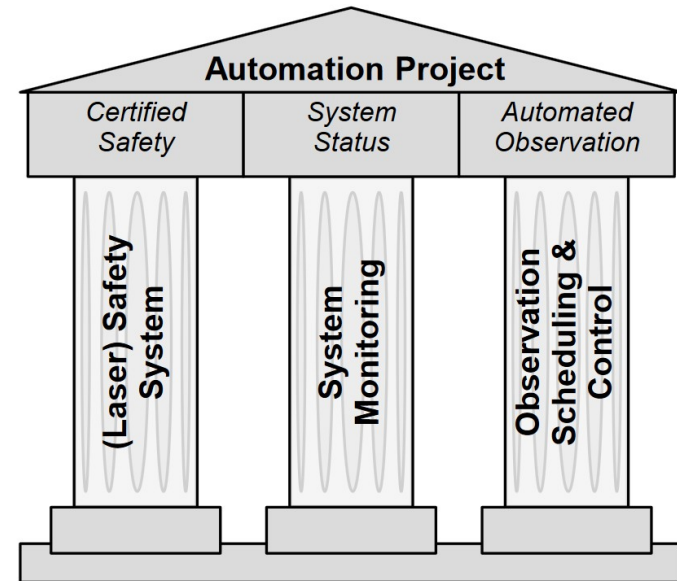
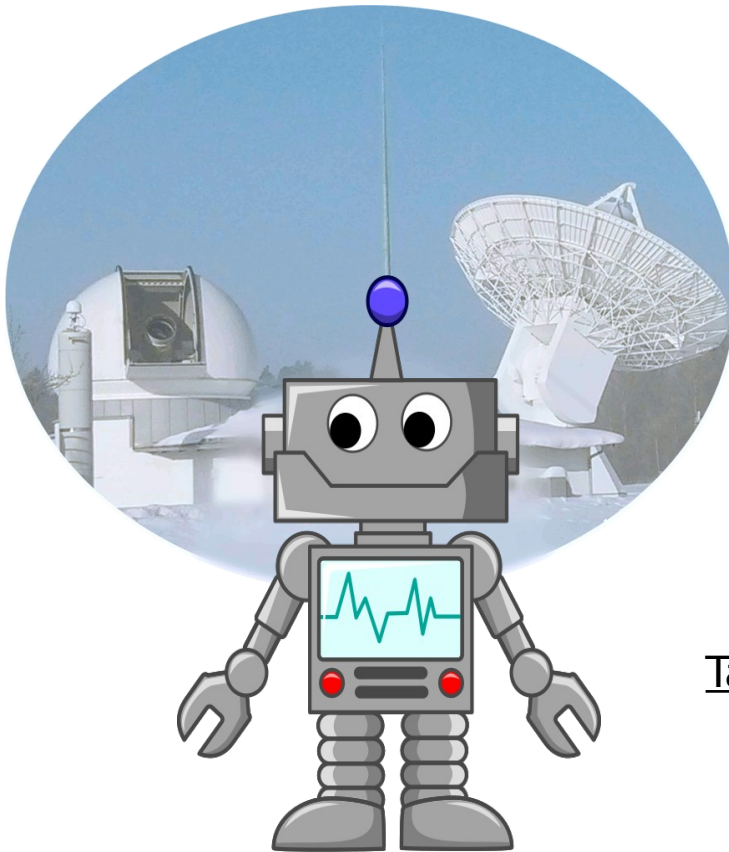
Web-based approach for system monitoring & remote SLR control

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Geodetic Observatory Wettzell
¹Technical University of Munich

Automation Design Principle

The three pillars of the automation project

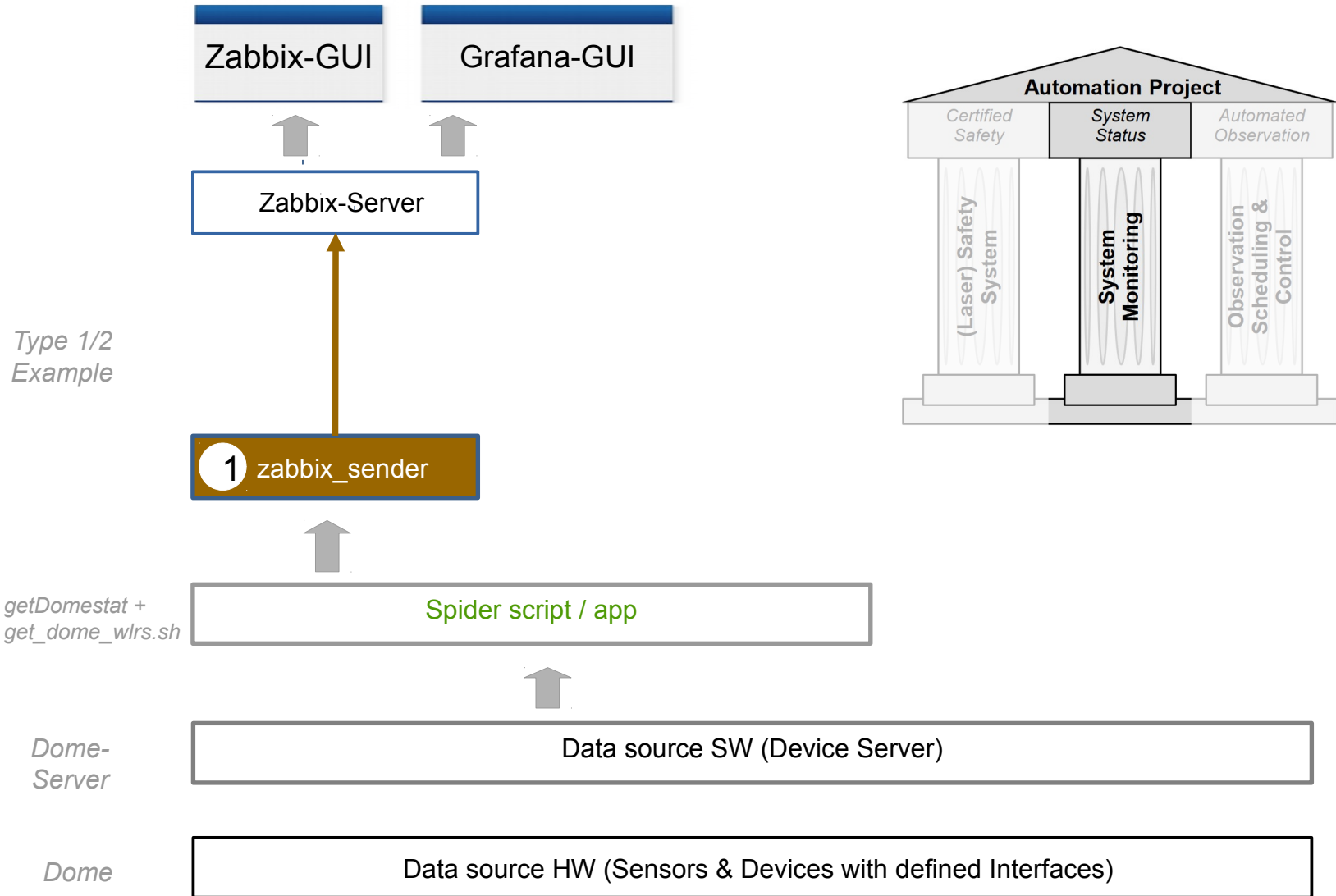


Targets:

- Each pillar is independent from the others
- Prepared for Remote Control and Operation
- Maximum Safety and Reliability

System-Monitoring-Dataflow

Type 1: Zabbix only

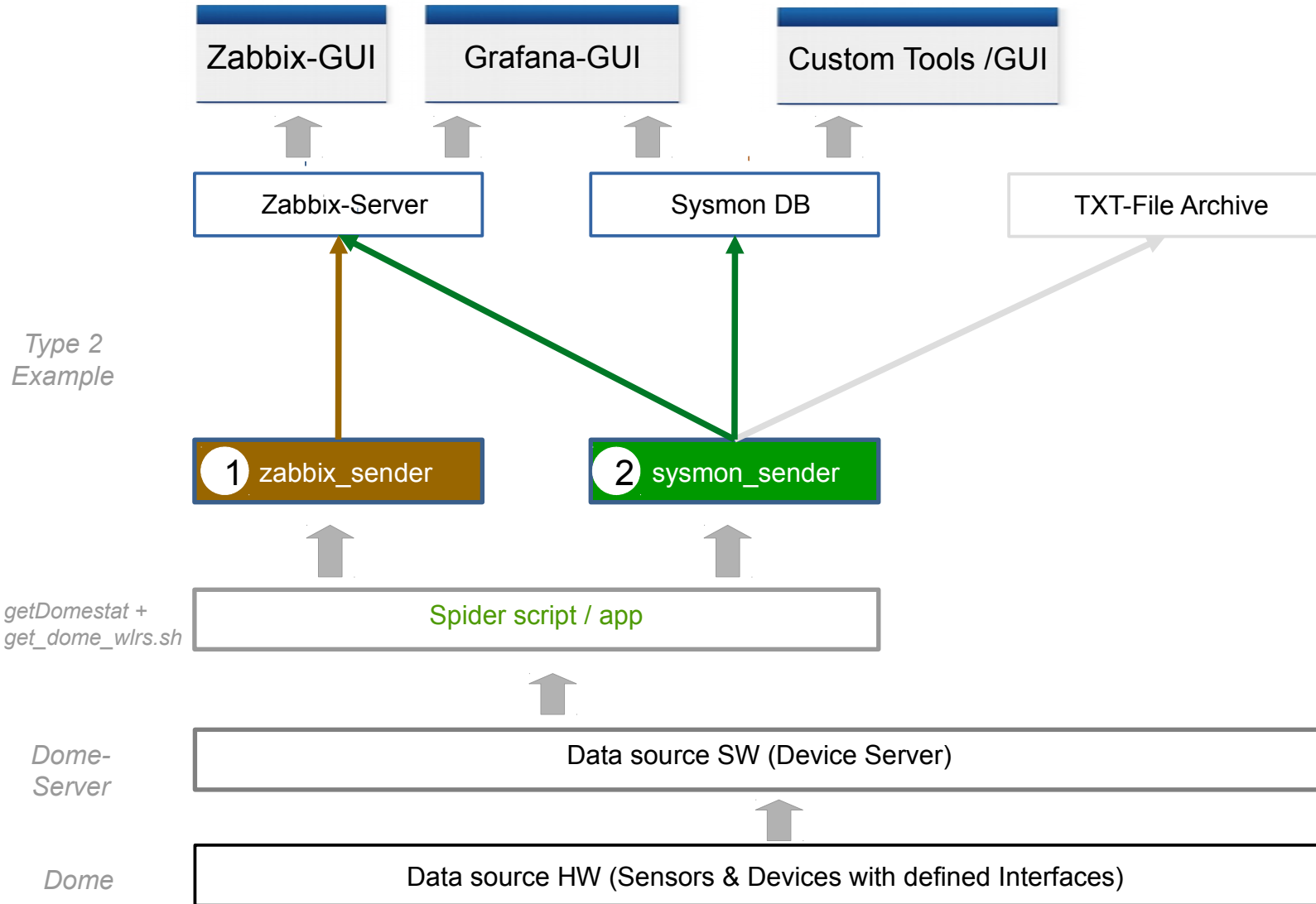




System-Monitoring - Grafana-Interface



System-Monitoring-Dataflow Type 2: With Sysmon API





System-Monitoring - Custom Tools / GUI

WLRS IR-Cam-Security-System Evaluation

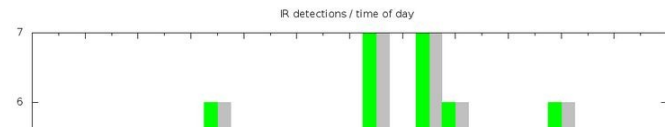
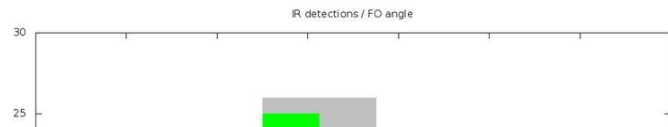
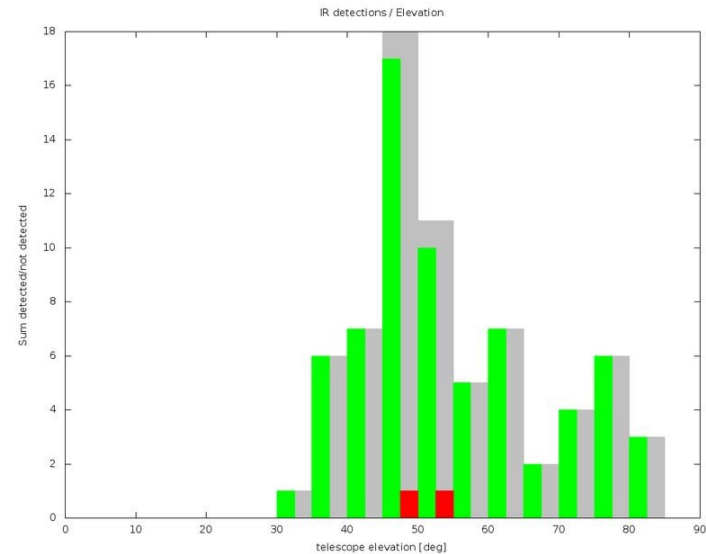
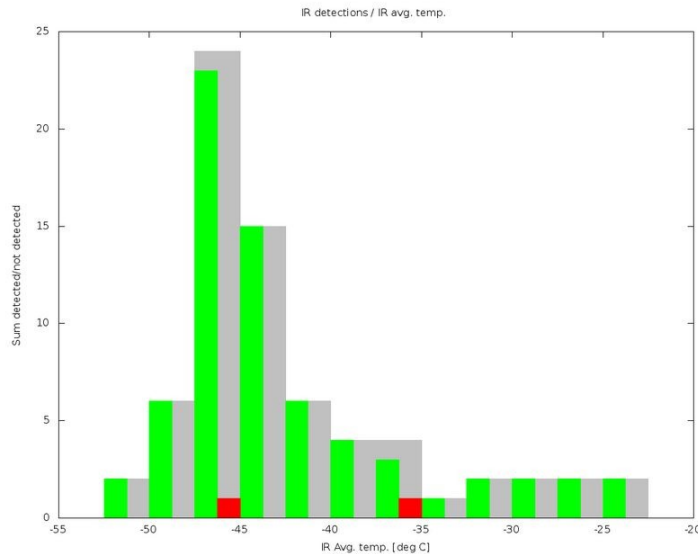
Start date: 2019-01-01 MJD: 58484
 End date: 2019-10-01 MJD: 58757
 Min. Angle [deg]: 1.25 DFS ADSB
 Min. Elevation [deg]: 20
 Max. IR-Avg. [deg C]: -20
 Max. IR-Delta(Min-Avg) [deg C]: 10
 Max. FO-range [m]: 10000

Total number of events: 70
 Number of detected events: 68 (97%)
 Number of not det. events: 2 (3%)

[Result as CSV file](#)

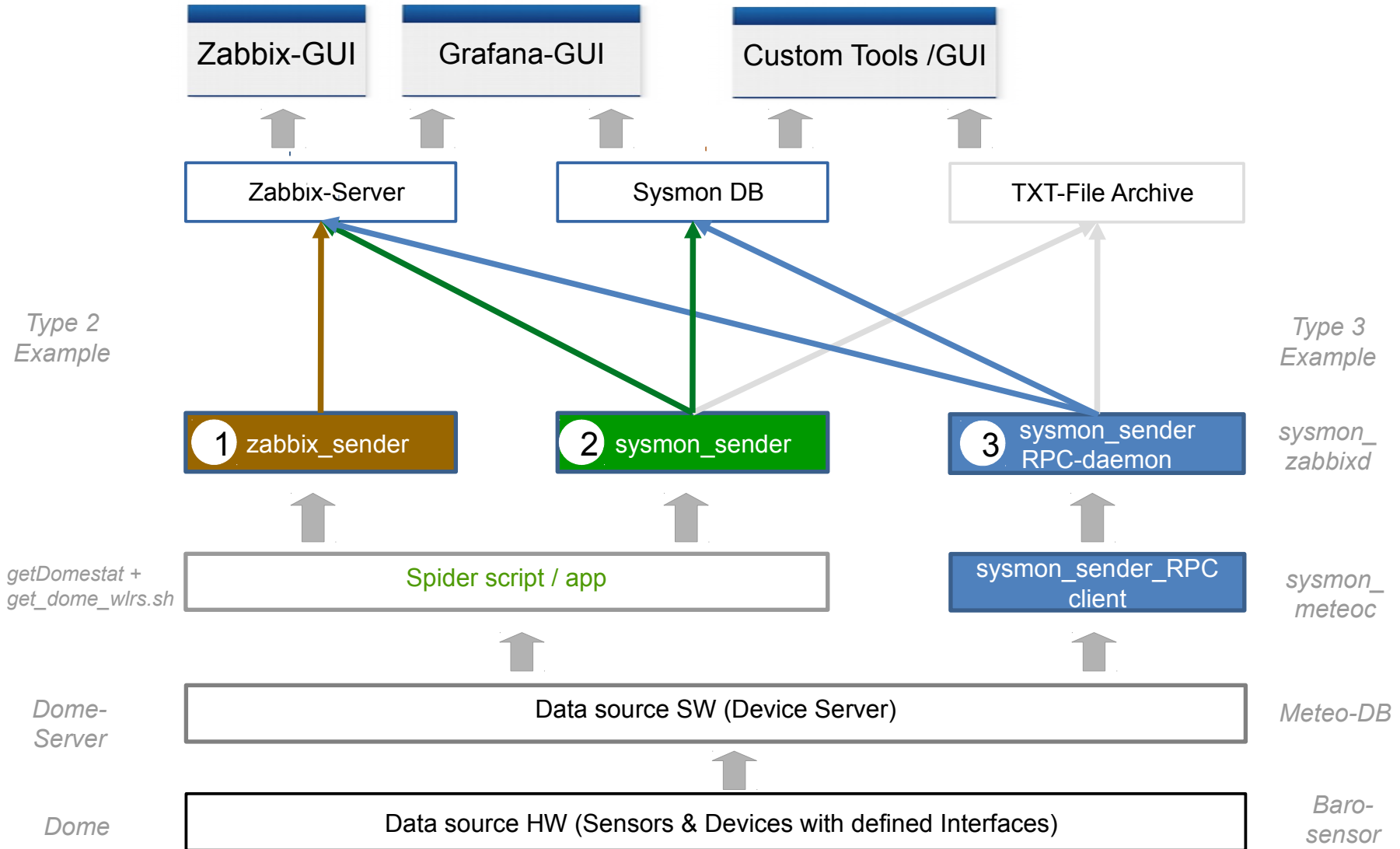
Notes This page shows statistics about detected or not detected flight-objects (FO) by the IR-Camera image recognition system. The maximum IR-camera recognition angle to the optical axis of the telescope is 3° vertical and 4° horizontal. The FO data are collected from the DFS or ADSB datastream. The earliest date when all necessary data were monitored is 2018-06-26.

Legend
 Detected by IR-cam █
 Not det. by IR-cam █



System-Monitoring-Dataflow

Type 3: Sysmon API via RPC



System-Monitoring - Zabbix-Interface

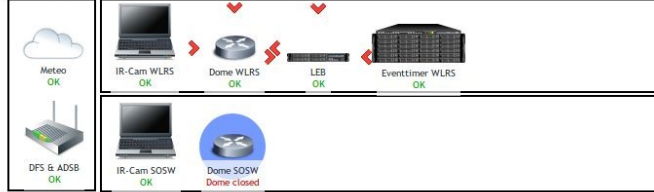
ZABBIX Monitoring Inventory Reports Configuration Administration

Dashboard Problems Overview Web Latest data Graphs Screens Maps Discovery Services

Dashboard

All dashboards / Dashboard

SLR Systems



LEB Status

Items	WLRs_LEB
WLRs_LEB_ADSB	Aircraft Detection (0)
WLRs_LEB_Building	1
WLRs_LEB_DFS	Aircraft Detection (0)
WLRs_LEB_IRCAM	0
WLRs_LEB_Laser	0
WLRs_LEB_Observer	1
WLRs_LEB_Radar	1

Nubi

Nubigramm - Geodätisches Observatorium Wettzell

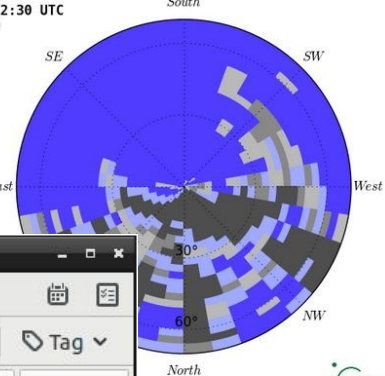
Date: 2019-10-16 12:30 UTC
 Filename: M1910161.230
 Horizon: 69.0°

Transp. Clouds


- CLCov: 30.3 %
- HighLCL: 0.0 %
- MidLCL: 9.4 %
- LowLCL: 20.9 %
- Precip: N
- Tzero: 14.0 °C
- Tblue: -48.4 °C

MainCloudBase:

- Cov: 0.0 %
- Temp: - °C



WLRs Computers



Problems

Time	Recovery time	Status	Info	Host	Problem · Severity
12:43:06	12:43:21		WLRs_Dome	Dome not aligned	
12:42:57	12:43:06		WLRs_Dome	Dome not aligned	
12:42:05	12:42:57		WLRs_Dome	Dome not aligned	
12:41:53	12:42:05		WLRs_Dome	Dome not aligned	
12:41:51	12:41:53		WLRs_Dome	Dome not aligned	
12:41:40	12:41:51		WLRs_Dome	Dome not aligned	
12:39:28	12:39:33		WLRs_Dome	Dome not aligned	
12:31:58	12:32:01		WLRs_Dome	Dome not aligned	

Problem: Thies data old - Inbox - Mozilla Thunderbird

Home Problem: Thies data old

Get Messages Write Chat Address Book Tag

Reply Forward Archive Junk Delete More

From wlr-s1-zabbix@fs.wettzell.de

Subject **Problem: Thies data old** 10:24

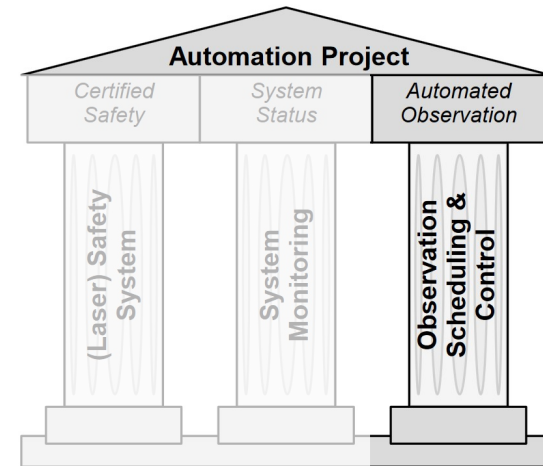
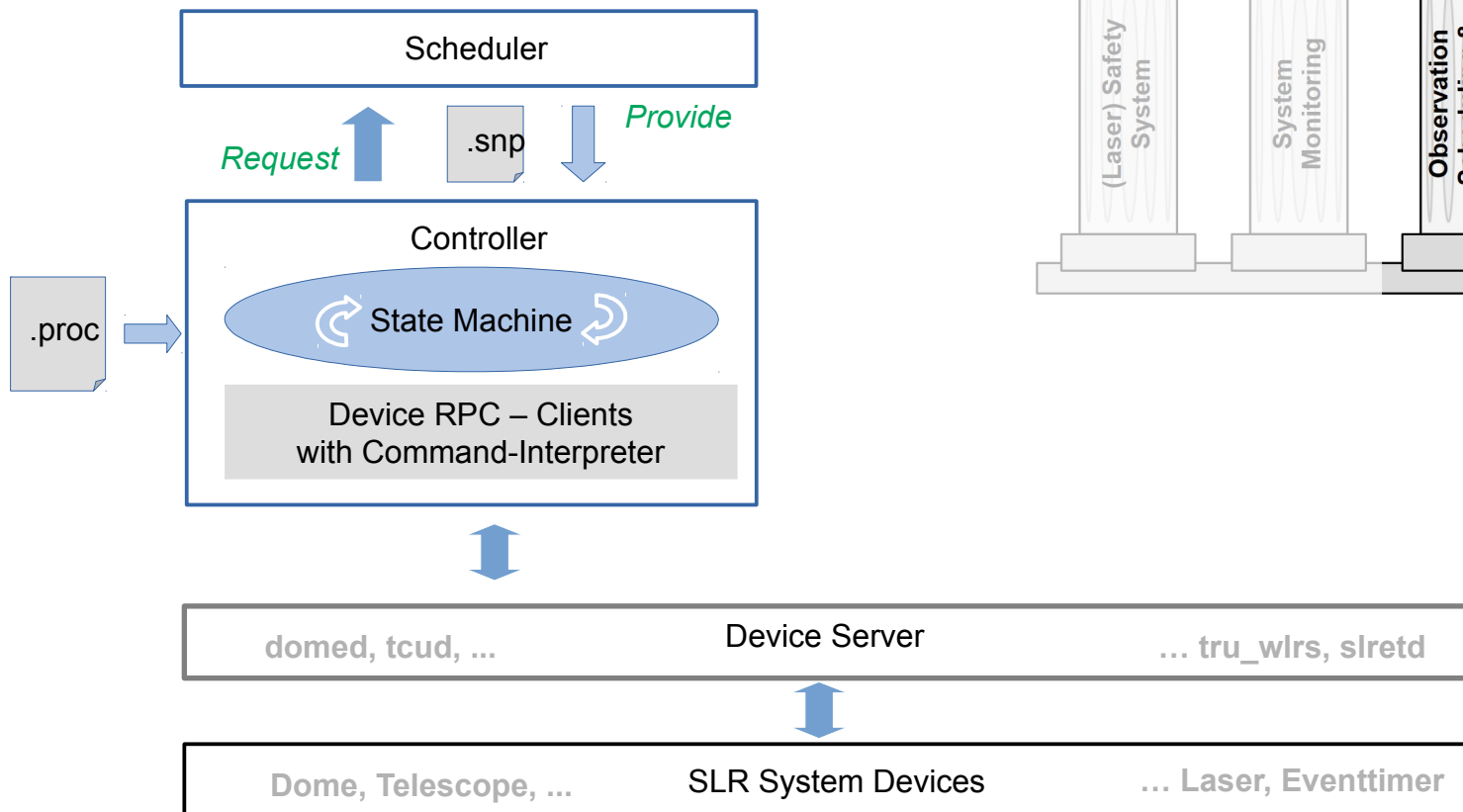
To Me

Problem started at 08:24:38 on 2019.10.17
 Problem name: Thies data old
 Host: WLRs_Meteo
 Severity: High

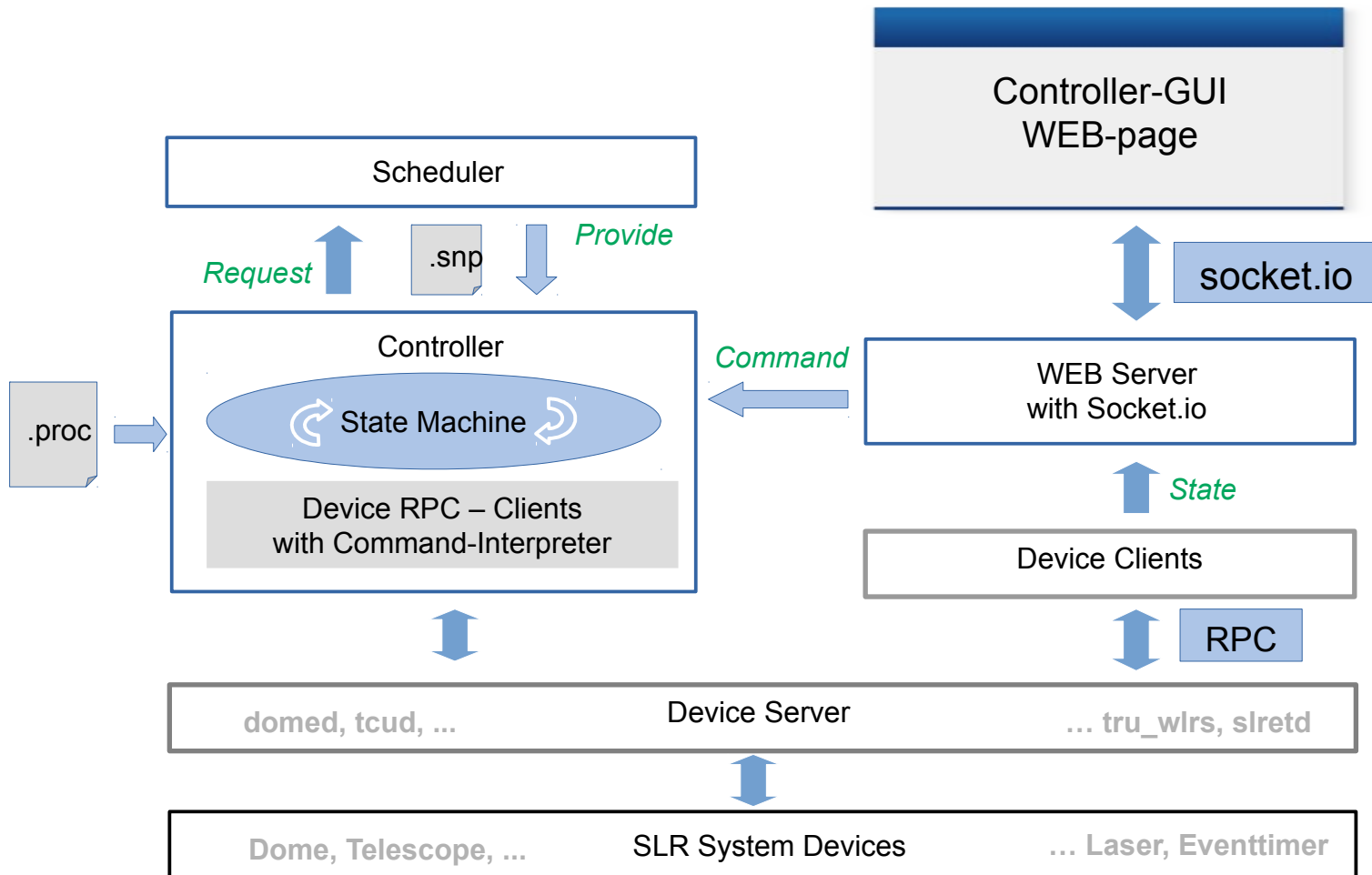
Original problem ID: 484460

Today Pane

Observation, Scheduling & Control

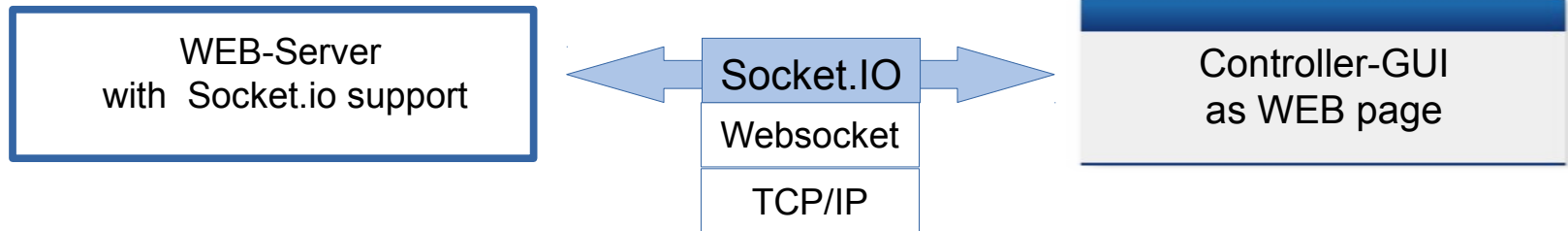


Observation, Scheduling & Control





WEB-Control-GUI

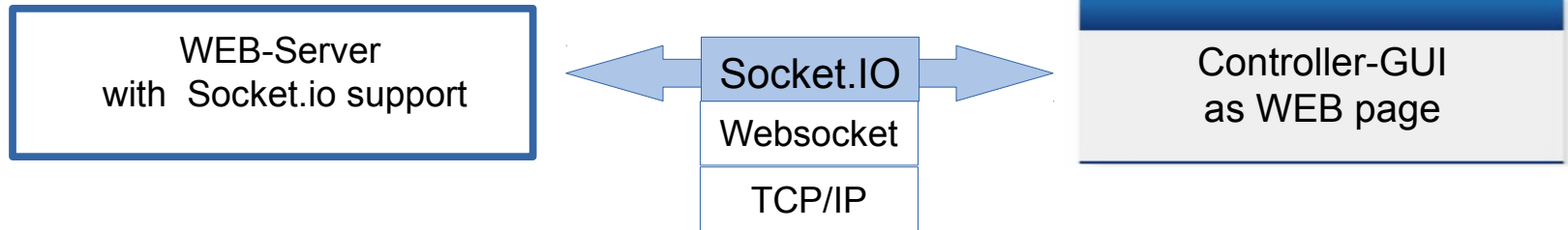


- Javascript/Node, Python or ...
- Event driven
- Bidirectional realtime communication
- Automatic Data encoding as JSON

- HTML+ CSS + Javascript
- Platform independent
- No installation required
- Works everywhere



WEB-Control-GUI

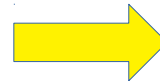


- Javascript/Node, Python or ...
- Event driven
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SEND

```
socket.emit('TCU', TCUInfo);
```

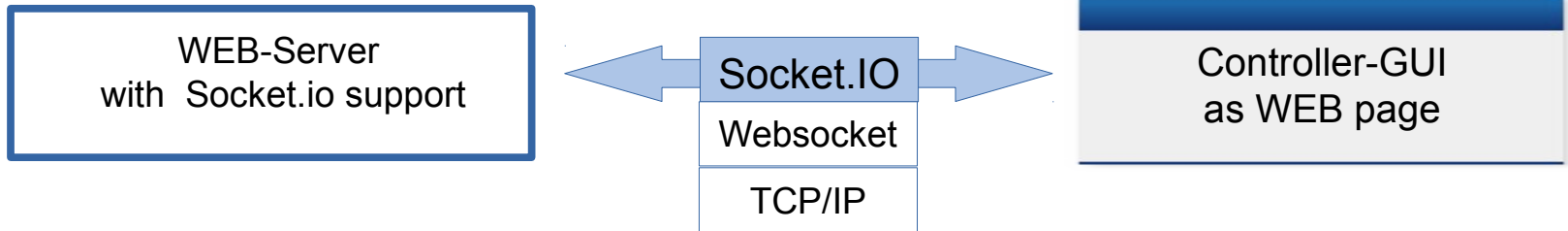


RECEIVE

```
socket.on('TCU', function(tcu) {
    $('#aziDisp').text(tcu.azi);
    $('#eleDisp').text(tcu.ele);
});
```



WEB-Control-GUI



- Javascript/Node, Python or ...
- Event driven
- Bidirectional realtime communication
- Automatic Data encoding as JSON

- HTML+ CSS + Javascript
- Platform independent
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- Works everywhere

SEND

```
socket.emit('TCU', TCUInfo);
```

RECEIVE

```
socket.on('TCU', function(tcu) {
    $('#aziDisp').text(tcu.azi);
    $('#eleDisp').text(tcu.ele);
});
```

RECEIVE

```
socket.on('command', function(cmd) {
    exec(cmd);
});
```

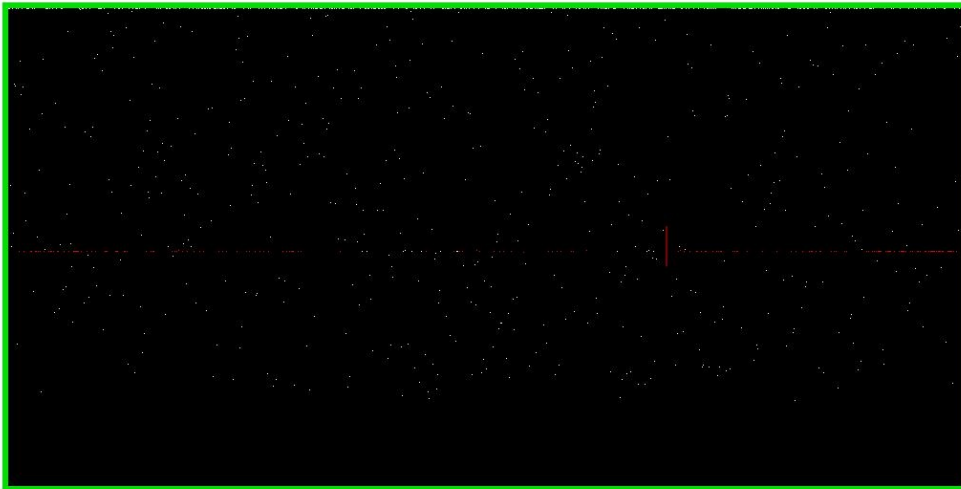
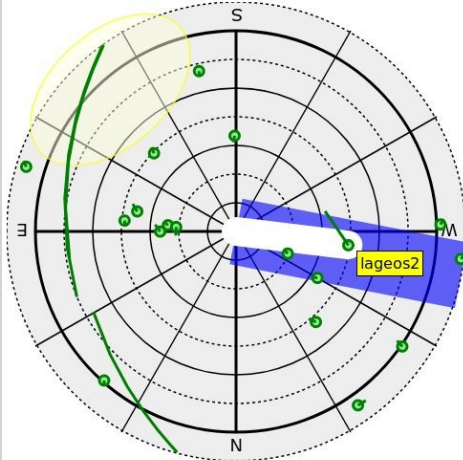
SEND

```
socket.emit('command',
    $('#ctrlInput').val());
```

Common GUI System CTRL

Overview | **WLRs CTRL** | WLRs Eval. | Sysmon

Mon, 14 Oct 2019 08:23:18 GMT MJD: 58770 SOD: 30198

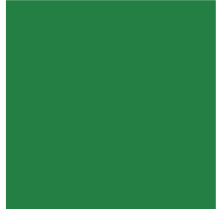
Rate: 0.0%, Noise: 11.5%, Total Hits: 10048, NPs: 5, TB: 0.000627, Max: 00003 @ -4500 & Col-Avoid: 0 (lagesos2)

OWIS Controller Field of View: <input type="text" value="9"/> <input type="text" value="0"/> Beam divergence: <input type="text" value="4.5"/> <input type="text" value="0"/> Aperture: <input type="text" value="50"/> <input type="text" value="0"/> Neutral density Filter: <input type="text" value="0"/> <input type="text" value="0"/>		Telescope Azimut <input type="text" value="276.9"/> Elevation <input type="text" value="50.6"/> Set Azi <input type="text"/> Set Ele <input type="text"/> Long <input type="text" value="6"/> Cross <input type="text" value="6"/> SEARCH RESET Range Step Speed <input type="text" value="10"/> <input type="text" value="2"/> <input type="text" value="1.5"/> <input type="button" value="↑"/> <input type="button" value="←"/> <input type="button" value="■"/> <input type="button" value="→"/> <input type="button" value="↓"/>		Dome CLOSE <input type="text" value="281"/> Set Azi <input type="text"/> Mode <input type="text" value="Manual"/>		Controller <input type="button" value="Init"/> <input type="button" value="Stop"/> <input type="button" value="Cancel"/> <input type="button" value="Calibr."/> <input type="text"/>	
---	--	--	--	---	--	---	--

- galileo219
- beidou3m10
- galileo204
- glonass125
- glonass105
- galileo209
- galileo217
- beidou3m9
- galileo221
- galileo214
- glonass136
- glonass138
- beidou3m2
- glonass133
- galileo212
- glonass140
- lagesos2**
- galileo202
- gracefo1
- gracefo2
- swarmb



Common GUI Data evaluation & Sysmon Alarms

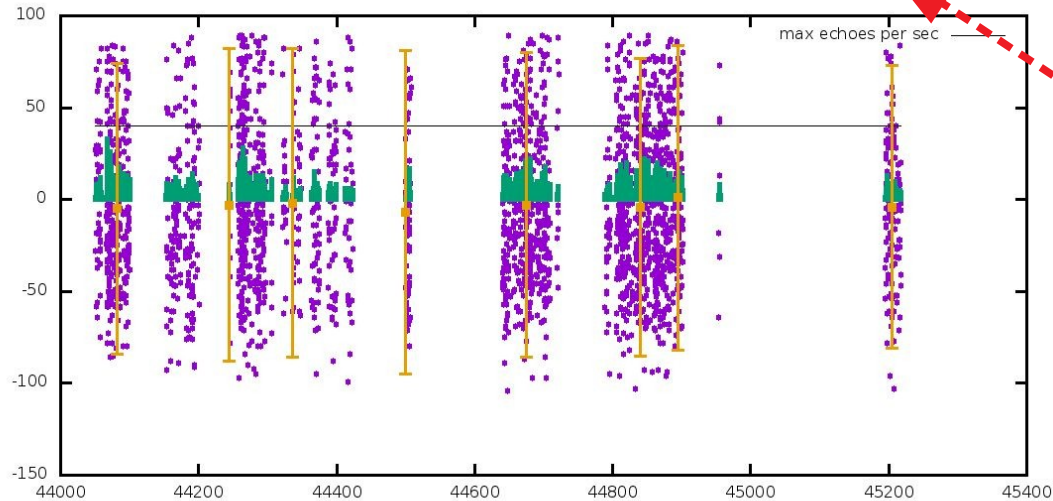


20191016124128-cryosat2
20191016121257-lageos1
20191016113727-ajisai
20191016105050-etalon2

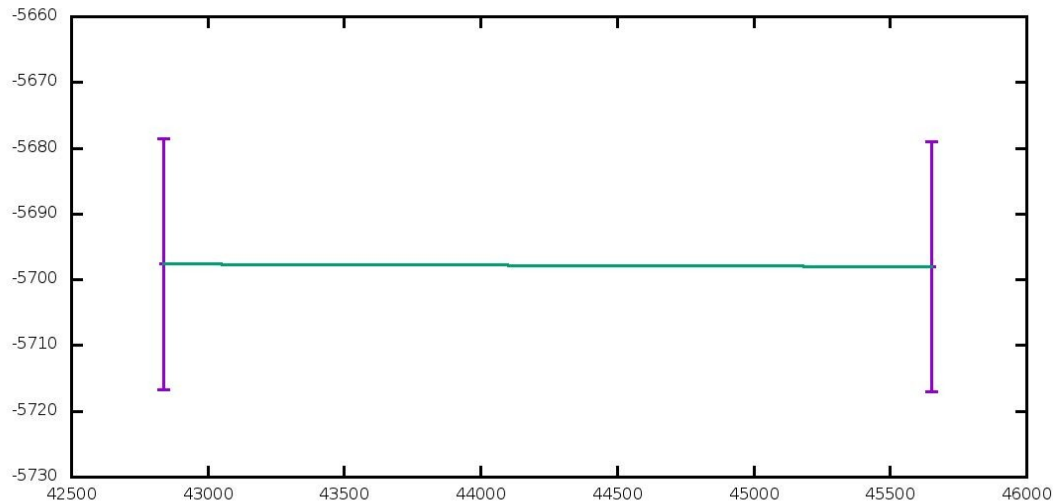
Overview WLRs CTRL WLRs Eval. **Sysmon**

WLRs_Meteo: Rain

lageos1 Total Echoes: 2604 RMS: 12.3 mm



Red flashing
Sysmon-Tab



Refresh Prev Next Delete Investigate Send to EDC Show log-files



Web-based approach for system monitoring & remote SLR control

Thank you!

Time	Recovery time	Status	Info	Host	Problem - Severity	Duration	Ack	Actions
12:43:08	12:43:21	WLRs_Dome	Dome not aligned		15s	No		
12:42:57	12:43:06	WLRs_Dome	Dome not aligned		9s	No		
12:42:55	12:42:57	WLRs_Dome	Dome not aligned		52s	No		
12:41:53	12:42:05	WLRs_Dome	Dome not aligned		12s	No		
12:41:51	12:41:53	WLRs_Dome	Dome not aligned		2s	No		
12:41:40	12:41:51	WLRs_Dome	Dome not aligned		11s	No		
12:39:28	12:39:33	WLRs_Dome	Dome not aligned		5s	No		
12:31:58	12:32:01	WLRs_Dome	Dome not aligned		3s	No		