

# Upgrade of the OCM Observatory New Control Software

CAMK Annual Meeting  
2024

presented by:

Marek Górski

Mikołaj Kałuszyński

Miroslaw Kicia

# OCA - set up, software environment & observers

I speaker:

**Marek Górski**

Member of the Araucaria Project

Nicolaus Copernicus Astronomical Centre  
of the Polish Academy of Sciences - Warsaw

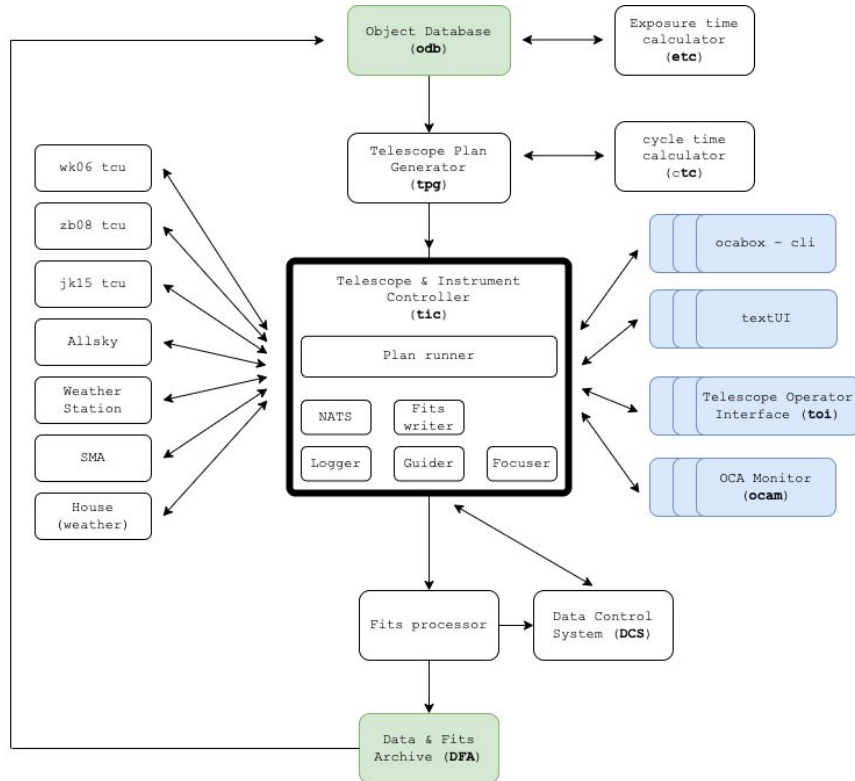


ASA training, installation, **testing** CCD,  
testing mount & components, **network**  
**set-up**, learning ASA, Andor (**SDK**),  
searching available **technologies**,  
**constant troubleshooting**



- cooperation with **all observers**
- **admins** (Krzysiek, Artur, Staszek, Przemek)
- **Ernest Lasek**, Piotr Wielgórski, Wojtek Pych

# Complexity of OCM software



## challenges - boundaries

- only 2 observers for 5 telescopes
- operator-focused control room
- remote control room (camk)
- 70 computers & VM's
- 30 systems
- ASA mount (alt-az, eq), Halfman
- optical CCD, NIR CCD, spectrometer
- different observing programs
- fully automated and fully remote software need
- existing software solutions do not meet our needs



Another speaker:

Mikołaj Kałuszyński

Member of the Araucaria Project

Nicolaus Copernicus Astronomical Centre  
of the Polish Academy of Sciences - Warsaw

# Araucaria Database

- **FITS Indexer:**  
Scans entire araucaria disk space for FITS files  
Calculates unique digest and discovers duplicates  
Determines instrument-independent metadata
- **FITS Database:**  
Stores and presents FITS files data
- **Object Database:**  
Stores and presents astronomical targets
- **Coverage Charts:**  
Plots phase coverage charts and timelines for targets, based on FITS files *hjd*



This screenshot shows the search results interface of the Araucaria Database. At the top, there are navigation links for Home, Fits, Object, and Charts. Below the search bar, there are filters for "Filters" and "Details". The main content is a table of search results with columns for det, obstype, object, objoralias, ra, dec, date, filter, exptime, instrument, and path. The table contains 10 rows of data, each representing a different observation.

det	obstype	object	objoralias	ra	dec	date	filter	exptime	instrument	path
Q	SPECTRID	E_246891964	E_246891964	04:43:27.0400	+16:40:24.2400	2021-01-20T01:42:05.410000	None	899.996525	HARPS	/work/korvus/HARPS_19_safetoremove/HAI_20T0142:05:410_s1
Q	SPECTRID	E_246891964	E_246891964	04:43:27.0400	+16:40:24.2400	2021-01-20T01:42:05.410000	None	899.996525	HARPS	/work/korvus/HARPS_19/HARPS_2021-01-20T0142:05:410_s1
Q	SPECTRID	E_246891964	E_246891964	04:43:27.0400	+16:40:24.2400	2021-01-20T01:42:05.410000	None	899.996525	HARPS	/work/korvus/HARPS_01-19/HARPS_2021-01-20T0142:05:410_s1
Q	SPECTR	E_246891964	E_246891964	04:43:26.7840	+16:40:28.5600	2019-03-17T23:54:23.345000	None	1099.998072	HARPS	/work/korvus/HARPS_17/HARPS_2019-03-17
Q	SPECTR	E_246891964	E_246891964	04:43:26.7840	+16:40:28.5600	2019-03-17T23:54:23.345000	None	1099.998072	HARPS	/work/korvus/HARPS_17_safetoremove/taw_17T23_54_23_346.fr
Q	SPECTR	E_246891964	E_246891964	04:43:26.7840	+16:40:28.5600	2019-03-17T23:54:23.345000	None	1099.998072	HARPS	/work/korvus/HARPS_03-17/taw/HARPS_20_17T23_54_23_346.fr
Q	SPECTRID	E_246891964	E_246891964	04:43:26.7840	+16:40:28.5600	2019-03-17T23:54:23.345000	None	1099.998072	HARPS	/work/korvus/HARPS_17_safetoremove/HAI_17T23_54_23_346_s
Q	SPECTRID	E_246891964	E_246891964	04:43:26.7840	+16:40:28.5600	2019-03-17T23:54:23.345000	None	1099.998072	HARPS	/work/korvus/HARPS_17/HARPS_2019-03-17T23_54_23_346_s

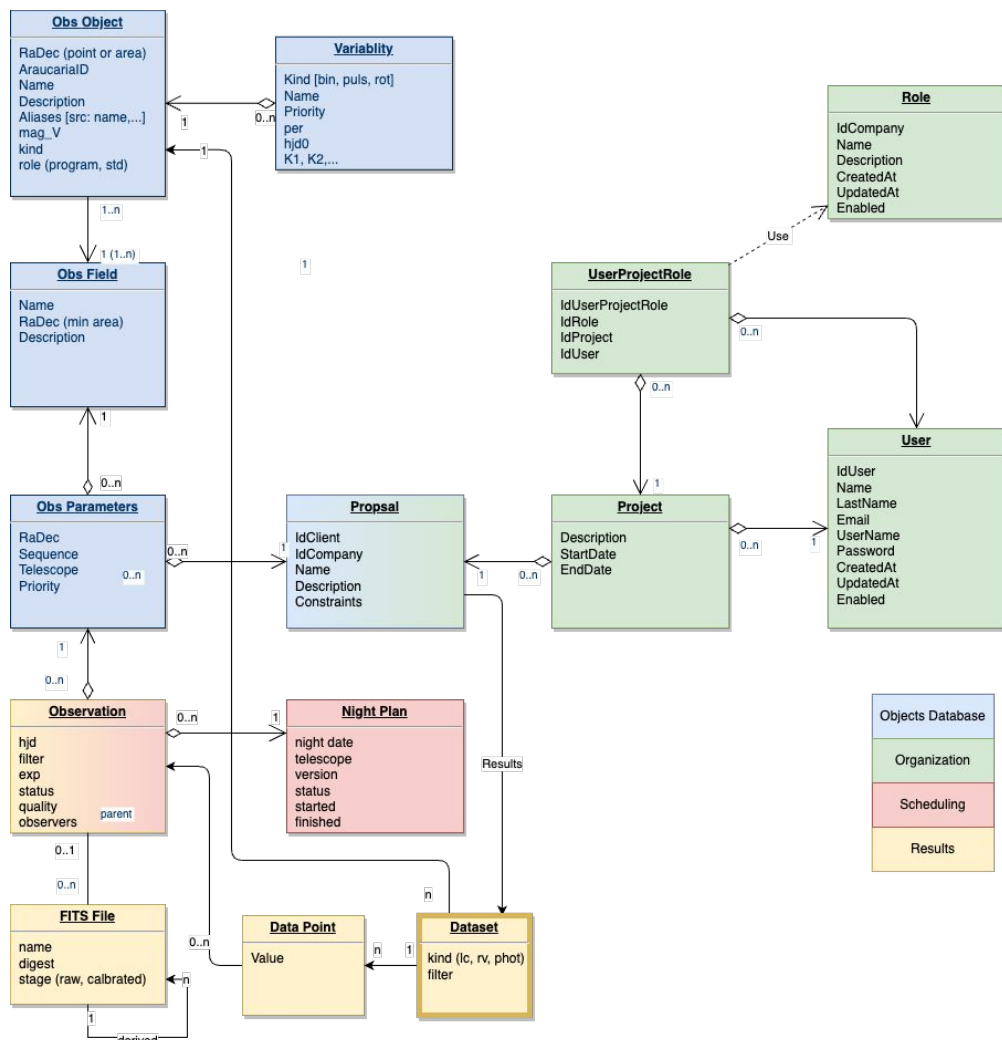
This screenshot shows the object details page for the Araucaria Database. The page is divided into two main sections: "Object list" and "Object details". The "Object list" section shows a table of objects with columns for det, name, hname, ra, dec, and type. The "Object details" section shows a "Radial Velocity Diagram" and a "Phased diagram". The "Radial Velocity Diagram" shows a plot of radial velocity versus phase, with a red line representing the HARPS instrument and a blue line representing the HARPS instrument. The "Phased diagram" shows a plot of phase versus phase, with a red line representing the HARPS instrument and a blue line representing the HARPS instrument.

det	name	hname	ra	dec	type
Q	TYC6874-632-1	TYC6874-632-1	288.0421	-23.0064	ECL
Q	E_246891964	E_246891964	70.8637	16.6758	ECL
Q	V440_Per	V440_Per	35.9656	55.3649	PULS
Q	BQ_ind	BQ_ind	313.8903	-56.742	PULS
Q	zeta_Gem	zeta_Gem	106.0272	20.5703	PULS
Q	BH_Oph	BH_Oph	273.9607	12.0966	PULS



# Araucaria Database

- **FITS Database** (existing): RAW, Calibrated, Spectroscopic
- **Objects** (existing): Targets, Fields, Variability
- **Organization**: Projects, Proposals, People
- **Scheduling**
- **Results**: Curves, Field photometry





# IT Architecture Foundations

- **Autonomy** - state of the internet connection does not affect operations
- **Modern** solutions and technologies - no technical debt
- **Python** language - as the programming language our group is familiar with
- **Container-ready Microservice** architecture
- **Redundancy** - no single point of failure thanks to distributed architecture
- **Local/Remote** - control rooms in Observatory and CAMK
- **Open Source** Software (MIT license). Universal software for different kinds of observatories
- Drivers for various telescope interfaces: **ASCOM**, ACS (Alma Common Software), INDI



Another speaker:

Mirosław Kicia

Member of the Araucaria Project

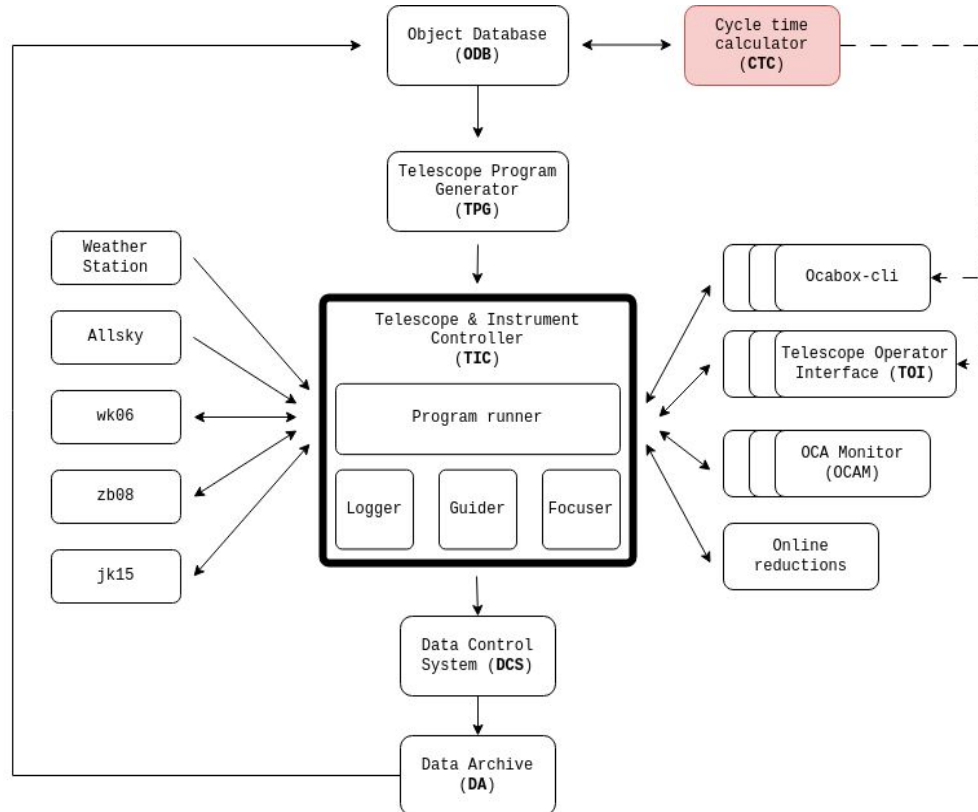
Nicolaus Copernicus Astronomical Centre  
of the Polish Academy of Sciences - Warsaw



# OCM software development

We are finishing the first iteration of software development, necessary to perform observations:

- Telescope and peripheral communications
- Night plan runner (new syntax)
- Graphical user interfaces (GUI)
- Remote operating
- Observations scheduler



# Visualization and preliminary data analysis



*source: pixabay*

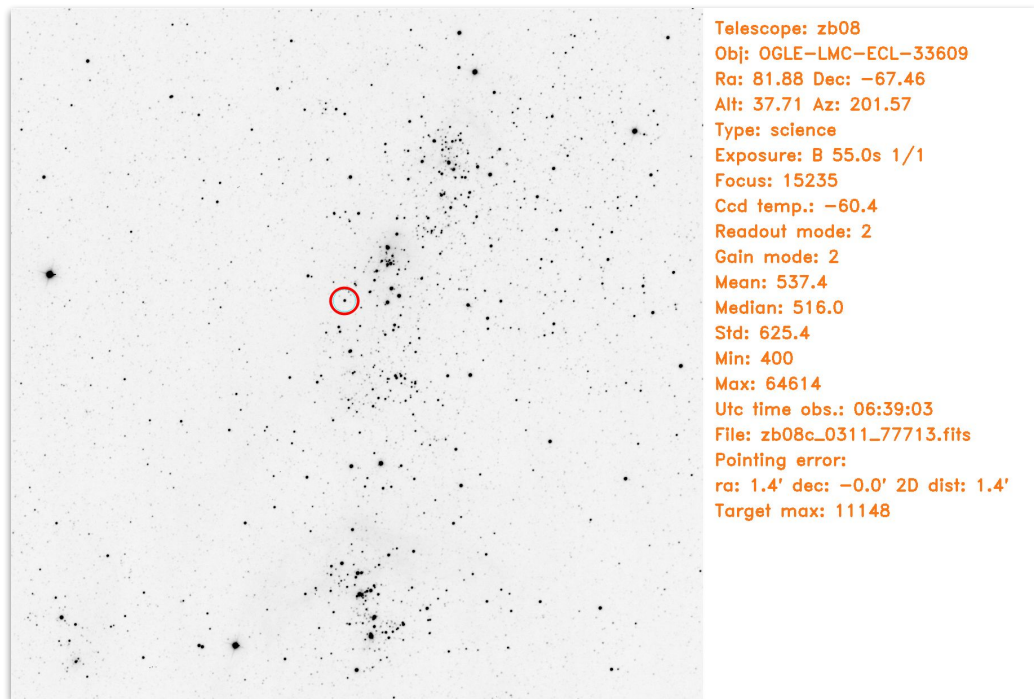
The multitude of tools allows observers to simply and easily track simultaneous observations and verify the collected data. If they are occupied at observation time reporting and communication system allow to make “quick look” on parameters and if needed they have more detailed and specialized summary reports.



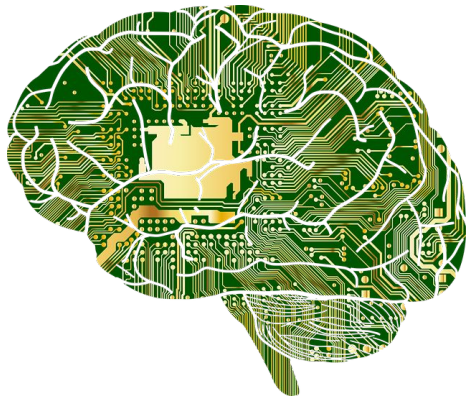
# Real-time data processing

Gives observers and data users greater opportunities to easily control massive amounts of data, without unnecessary workload:

- Parameters display
- Telescope pointing verification
- Target saturation verification
- Instrumental calibrated images
- Photometry and light curves (ongoing)



# Machine learning and other modern analytics methods



*source: pixabay*

- Predicting Telescope Cycle Time
- Scheduling observations
- Automatic rating calibration and science data
- Faster and more reliable calibration and reduction methods
- Use of computer vision and object analysis
- other