

Overwatcher's Guide to the Galaxy (the Universe, and Everything Else)

The Overwatcher is the highest-level component of the LVM operations software handling autonomous (robotic) observing. This page describes its design approach, decision logic, and how to interface with it.



[GORT](#) doing some observing

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- I cannot enable the Overwatcher, the switch won't change
- I want or need to go back to manual observing
- GORT complains that the Overwatcher is running
- Should I send the old-style log?

Overview of LVM software and tools

The LVM operations software is designed to be reasonably modular and with a bottom-up design structure. This is not an exhaustive overview of all the software components, and it's intended only to provide some background on how the Overwatcher works. Some of these components are expanded on later in this guider.

Actors

Each subcomponent (telescopes, k-mirrors, detectors, spectrograph mechanics, guiders, etc.) has an associated *actor*. An actor is a piece of software that can receive commands that follow a certain message protocol, perform actions based on the contents of the message, and reply to the user that emitted the message with replies based on the performed action. For example, the science telescope mount has an actor `lvm.sci.pwi` that allows to control its position, slewing, tracking, etc. To command the mount to go to certain RA/Dec coordinates one can command `lvm.sci.pwi gotoRaDecJ2000 3.56 -20.568` and the actor will respond with a series of message indicating that the message has been received, the telescope is slewing, it has reached the position, etc.

LVM actors are build around the [CLU](#) framework using RabbitMQ for message passing. Actors are (with some exceptions) the lowest-level pieces of operations software and they are meant to handle one single piece of hardware or subsystem. With few exceptions, users are not expected to directly interact with them, although in some cases GORT (see below) very thinly wraps actor commands as higher level functions.

GORT

[GORT](#) is a Python library that provides a programatic interface to the actor system and wraps more complicated logic (for example exposing multiple spectrographs) into user-friendly routines. For example, one can expose all three spectrographs for 10 seconds with a GORT script like

```
1 from gort import GORT
2
3 g = await GORT().init()
4 await g.specs.expose(10)
```

In the background the `expose()` function will connect and command multiple actors to check that the spectrographs are idle, the spectrograph mechanics are ready, etc. and then it will coordinate the exposure across the three spectrographs, issuing log messages along the way.

GORT provides three levels of access to the operations system:

- **Low-level:** access to all actors is possible in a programatic way. Users are not generally expected to use this part of the codebase, but GORT uses it internally to build the mid- and high-level functionality.
- **Mid-level:** routines like `specs.expose()` shown above provide a user-friendly, safe interface to a subsystem. These routines usually handle coordination between multiple actors. There are similar mid-level routines for guiding, enclosure management, etc.
- **High-level:** GORT provides some very high-level routines that handle large parts of the observing process. The main examples are the tile observing loop (via the `Gort.observe()` and `Gort.observe_tile()` functions) and the calibration routines. These high level processes can handle much of the night's observing, can run mostly unsupervised when conditions are good, and implement a moderate level of self-troubleshooting.



The online [GORT documentation](#) is still generally correct but has gotten a bit out of date and does not cover the Overwatcher.

Overwatcher

The Overwatcher is the highest-level component in the LVM operations software ecosystem. It builds on top of GORT (and it's part of the same software package) and aims to provide safe, unsupervised night observing. The Overwatcher is designed as a series of modules, each one handling a different aspect (calibrations, tile observing, weather alerts, ephemeris, etc.) A central module (the overwatcher itself, or main task) uses that information to decide whether it's safe to open the dome, triggers calibrations and observing, etc. Each module is built to self-troubleshoot and restart in case of an error.

lvmap

[lvmap](#) serves a RESTful API that allows to query information from different subsystems (spectrographs, metrology, actors, ephemeris, Kubernetes). The LVM webapp is populated via requests to this API, and the Overwatcher also uses it for some of its functionality (for example, the API contains the logic for when weather conditions are considered unsafe).

LVM webapp

The LVM webapp (<https://lvm-web.lco.cl>, usual SDSS-V credentials) is intended as a one-stop to monitor night observing, including interfacing with the Overwatcher. It also provides logging for some daytime engineering tasks (e.g., LN₂ fills). The webapp is described in more detail [below](#).

Webcams

There are several webcams monitoring the LVM enclosure. They can be accessed from the LCO network at <http://camaras-02.lco.cl> (if you don't know the password request it from the LVM operations team). Unfortunately the external website is protected by two-factor authentication and can not be accessed by a large group of people. To access the webcams from outside LCO connect to the LVM server and forward `camaras-02.lco.cl:443` to `localhost:18888` and navigate to `http://localhost:18888`.

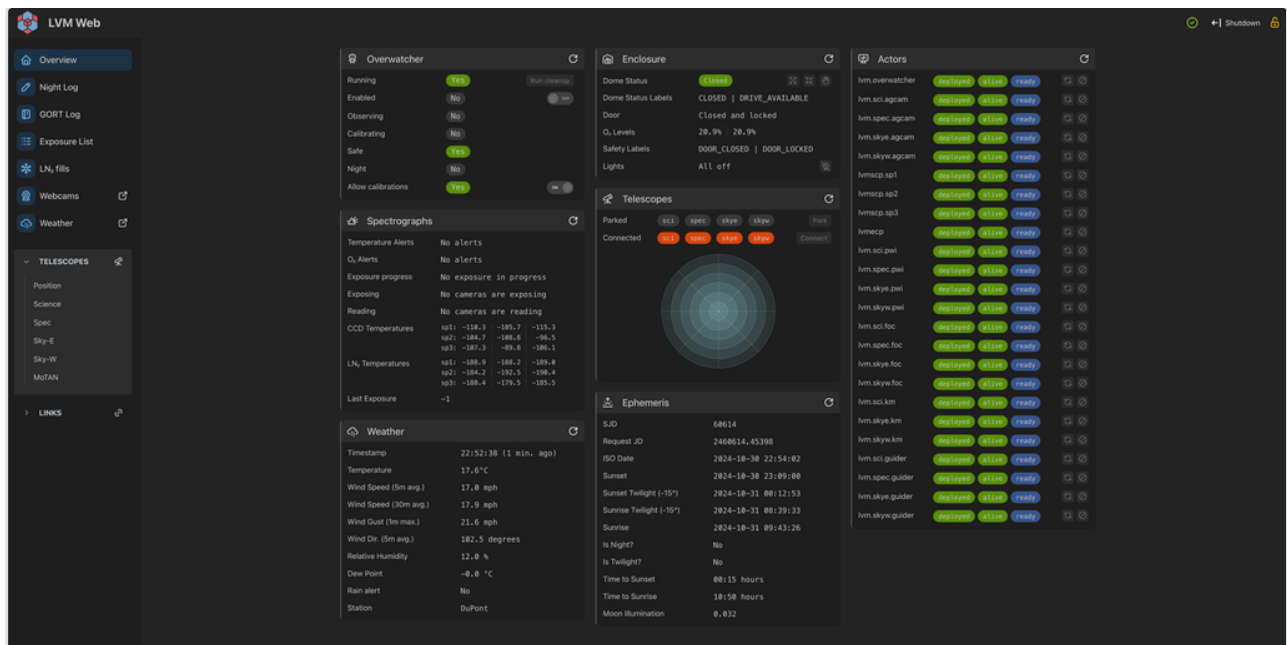
Slack channels

There are three channels in the SDSS-V Slack workspace that are relevant for observing. They are all normal channels and conversations can be had on them, but they are also used by an automated bot to output information about the observing system. It's recommended that observers join these channels.


- `#lvm-critical`: critical errors in the system. An alert to this channel should always be followed up on.
- `#lvm-notifications`: various automated notifications about the LVM system. Currently it's mainly used to report the status of LN₂ fills but in the future it may include more information.
- `#lvm-overwatcher`: notifications from the Overwatcher, including when it starts, gets enabled/disabled, when it's opening the dome or running calibrations, and which tile it's observing. This channel is useful to follow the observations during the night but can be quite verbose, so feel free to change the notifications to "mentions only" or mute it.

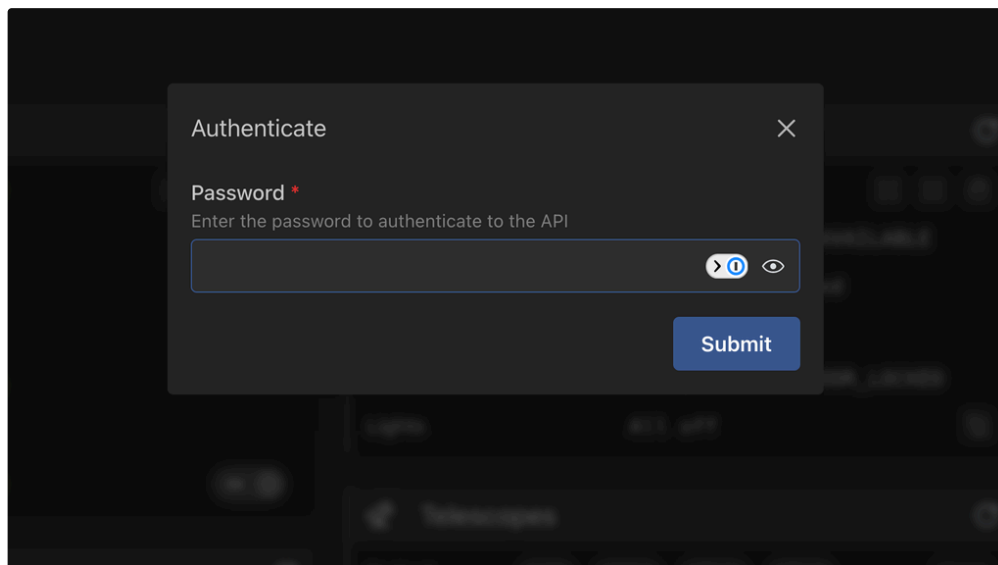
LVM webapp

Now let's have a closer look at the LVM webapp and its different sections. When navigating to <https://lvm-web.lco.cl> and after introducing the username (`sdss5`) and password (the usual SDSS-V data password), you should see the overview dashboard.




Dashboard

The dashboard is made up of a series of panels, each one displaying information about a different aspect of observation (overwatcher, ephemeris, etc.) In addition to displaying information, it also allow to perform some actions on the system. The buttons that allow actions on the real world are disabled by default (you'll see greyed out buttons that cannot be pressed) and protected with a secondary password. To enable them go to the top right lock icon  which should be open and yellow when not authorised. When you click on it you'll see a modal window



Write the secondary password (ask a team member if you don't know it) and click Submit. The lock icon should turn white and the action buttons will become enabled.

 If you are connecting to the LVM webapp from LCO (for example in a browser in a VNC session) make sure you navigate to <http://lvm-web.lco.cl> and not to <http://10.8.38.21:8080> or other address with an IP. You will be able to see the webapp but not authenticate since the connection won't be HTTPS.

We'll now quickly go over each one of the dashboard sections, although most of them should be pretty self-evident. Note that all the sections have a small refresh button to the right of the title. The sections refresh automatically (at different rates, depending on how often the data is expected to change and how critical they are) but you can always force a faster refresh by clicking that button.

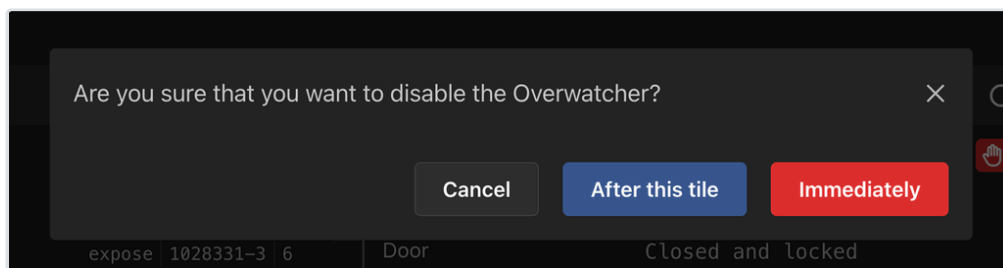
Overwatcher



The Overwatcher panel shows the current status of the Overwatcher and allows to enable it. Each of the rows has a label that can take values **YES** / **NO** and in some cases you can change its behaviour:

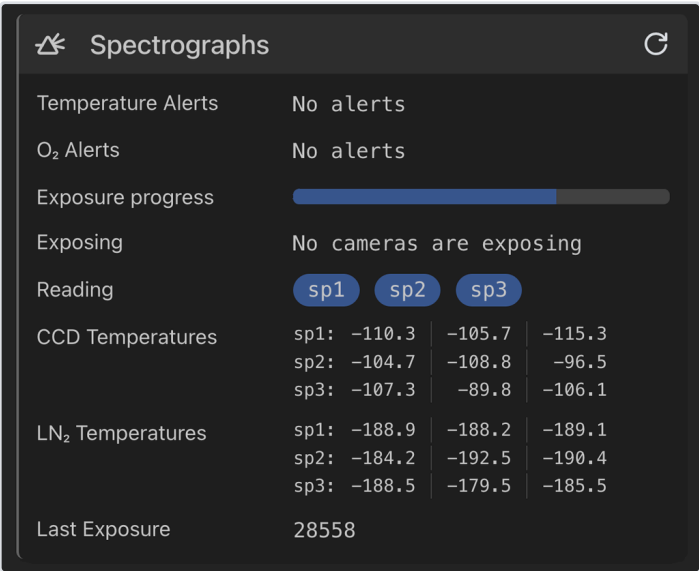
- **Running:** indicates whether the Overwatcher process is running. If this says **NO**, you can restart the process in the [actor status](#) panel. On the right there is a button that triggers the cleanup routine. This will stop guiding, abort any ongoing exposures, reset the spectrographs, turn off all lights, etc. Use it only if you think the system is in a weird state.
- **Enabled:** essentially this determines whether the Overwatcher is allowed to open the dome for observations and calibrations. You can change this by flipping the switch on the right side of this row (click only once and wait a little bit, it may take a few seconds for the Overwatcher to refresh). In general an observer will want to enable this 10-15 minutes before sunset and leave it enabled for the rest of the night. The Overwatcher should never try to open the dome if the conditions are unsafe, but it's best to keep it disabled during the day. Note that the Overwatcher can *close* the dome if the conditions are unsafe even when it is disabled. The only way to prevent this is to completely turn off the Overwatcher. For safety reasons the Overwatcher cannot close the dome if the enclosure is in local mode (the door to the telescope platform is unlocked).
- **Observing:** this indicates that the Overwatcher has open the dome for night observing and is running the observing loop (middle image above). To the right you can see the stage (slew, acquire, expose) currently being executed, the ID and dither position of the tile being observed, and the number of the standard (1 to 12) being observed. The **YES** / **NO** pill here can also take the value **CANCELLING** if the observing loop is going to be cancelled after this tile completes (see below).
- **Calibrating:** the Overwatcher is running a calibration (see rightmost image above). In this case the name of the calibration script will be shown.
- **Safe:** whether the conditions are safe to open and there are no alerts in the system. The Overwatcher will never open the dome if the conditions are unsafe (safe is **NO**) and will immediately close if that's the case.
- **Night:** whether it's night, meaning between evening -15 deg twilight and morning -15 deg twilight. Observing can only happen if night and safe are **YES**.
- **Allow calibrations:** whether calibrations are allowed. Calibrations will not be executed if this is disabled. Note that a calibration like the twilight flats will fail if Allow calibrations is enabled but the Overwatcher is not Enabled since it won't be able to open the dome.

If the Overwatcher is enabled and observing and you try to disable it you'll get a confirmation screen like this one



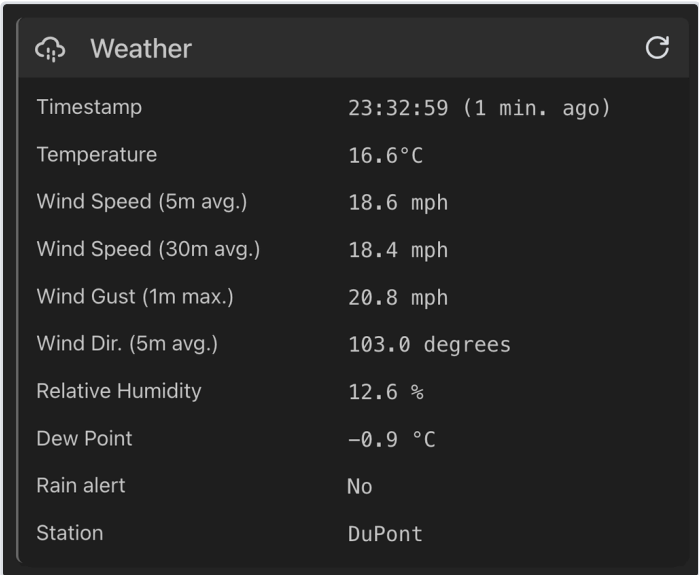
You can decide whether to disable the Overwatcher immediately (it will cancel the current exposure) or once the current tile has been observed. Disabling the Overwatcher won't close the dome.

Spectrographs



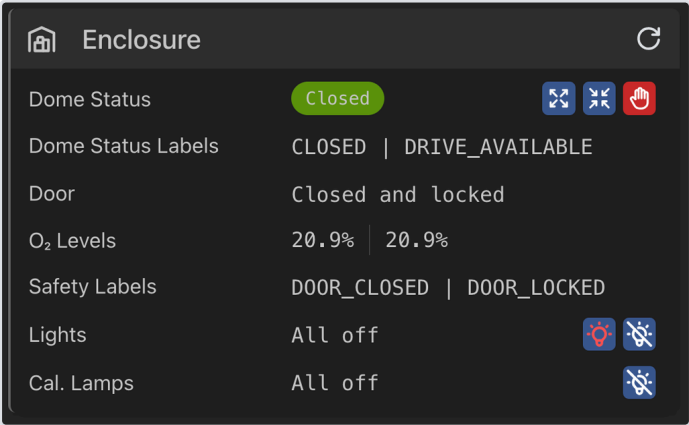
The spectrographs panel shows the status of the three spectrographs. When an exposure is in progress you'll see a progress bar and a series of pills indicating if the spectrographs are exposing or reading. There could also be spectrograph alerts (either the LN₂ or the CCD temperatures are too high or there is an oxygen alert going on). Those should be very rare but if there is an alert going on do not attempt to observe and disable the Overwatcher (although in this case the Overwatcher should register an unsafe state and not try to do anything). In some rare cases one of the CCD or LN₂ temperatures could go over the limit during an LN₂ fill (the value will show as red on the relevant sections). If you see this during a fill it's probably ok, but if it persists, please let somebody know. When an LN₂ fill is in progress you'll see a yellow flashing sign next to the panel title.

Weather



Shows the weather conditions. The timestamp indicates the age of the data being shown (it should refresh every minute). When a value is outside the safe range (for example the 30 minute wind speed average is over 35 mph) the value will turn red and the Overwatcher should change to `safe=false`. Clicking on the title of the panel will open a new windows and navigate to the LCO weather page.

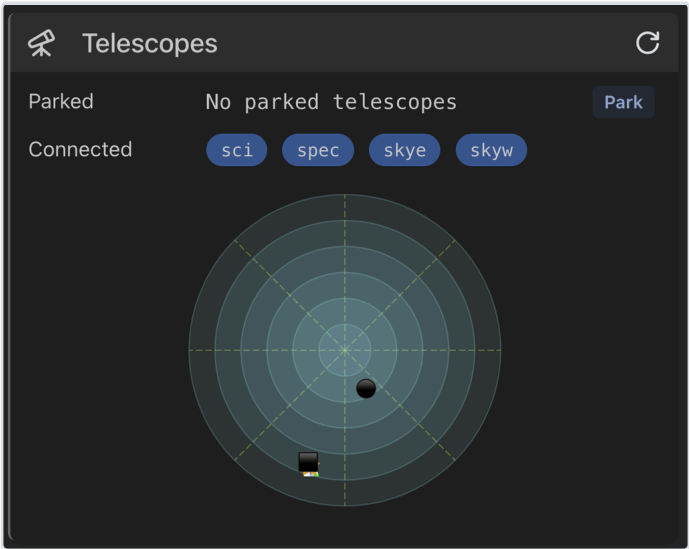
Enclosure



Shows the status of the enclosure, especially the dome position.

- **Dome status:** whether the dome is `Closed`, `Open`, or `Moving` (this is accompanied by a progress bar). To the right there are three buttons (require authentication) to open the dome, close it, or stop the dome while it's moving.
- **Dome status labels:** a list of the dome status flags. Normally this can be ignored.
- **Door:** indicate whether the door to the telescope platform is closed and locked. If it's not in this state the dome cannot be operated remotely.
- **O₂ levels:** the oxygen levels in the spectrograph room and utilities room. They should fluctuate around 21%. An alert is raised if they go below 19.5%.
- **Safety labels:** labels related to the door and oxygen level status.
- **Lights:** the enclosure lights that are on. They should all be all off for observing. The icon on the right can be used to turn off all the lights (make sure that nobody is in the enclosure before doing this by checking the webcams). The red bulb icon can be used to turn on/off the telescope platform red lights to check if the dome is properly closed.
- **Calibration lamps:** shows whether any of the calibration lamps (quartz, LDLS, arcs) are on. The button allows to turn them all off. Note that during calibrations some lamps will show as on here, which is expected and normal. Only turn off the lamps if you think they were left on by mistake.

Telescopes











Shows the position of the telescopes on an alt-az plot as four small icons. It also shows which telescopes are connected and parked (and allows to park the telescopes). Clicking on the telescope graph links to a larger version of the plot. This is usually not very relevant for observing but can be useful for troubleshooting. Note that when the telescopes are below 30 deg in altitude (for example when homed or parked) they don't show in the plot.

Ephemeris

Ephemeris	
SJD	60614
Request JD	2460614.48245
ISO Date	2024-10-30 23:34:53
Sunset	2024-10-30 23:09:00
Sunset Twilight (-15°)	2024-10-31 00:12:53
Sunrise Twilight (-15°)	2024-10-31 08:39:33
Sunrise	2024-10-31 09:43:26
Is Night?	No
Is Twilight?	Yes
Time to Sunset	-00:26 hours
Time to Sunrise	10:09 hours
Moon Illumination	0.032

The ephemeris for the night. The SJD on top is the special SDSS MJD (the integer of the current MJD + 0.4) and is the value that identifies the night. All other values should be self-explanatory.

Actor status

Actors				
lvm.overwatcher	deployed	alive	ready	 
lvm.sci.agcam	deployed	alive	ready	 
lvm.spec.agcam	deployed	alive	ready	 
lvm.skye.agcam	deployed	alive	ready	 
lvm.skyw.agcam	deployed	alive	ready	 
lvmscp.sp1	deployed	alive	ready	 
lvmscp.sp2	deployed	alive	ready	 
lvmscp.sp3	deployed	alive	ready	 
lvmeccp	deployed	alive	ready	 
lvm.sci.pwi	deployed	alive	ready	 
lvm.spec.pwi	deployed	alive	ready	 
lvm.skye.pwi	deployed	alive	ready	 
lvm.skyw.pwi	deployed	alive	ready	 
lvm.sci.foc	deployed	alive	ready	 
lvm.spec.foc	deployed	alive	ready	 
lvm.skye.foc	deployed	alive	ready	 
lvm.skyw.foc	deployed	alive	ready	 
lvm.sci.km	deployed	alive	ready	 
lvm.skye.km	deployed	alive	ready	 
lvm.skyw.km	deployed	alive	ready	 
lvm.sci.guidr	deployed	alive	ready	 
lvm.spec.guidr	deployed	alive	ready	 
lvm.skye.guidr	deployed	alive	ready	 
lvm.skyw.guidr	deployed	alive	ready	 

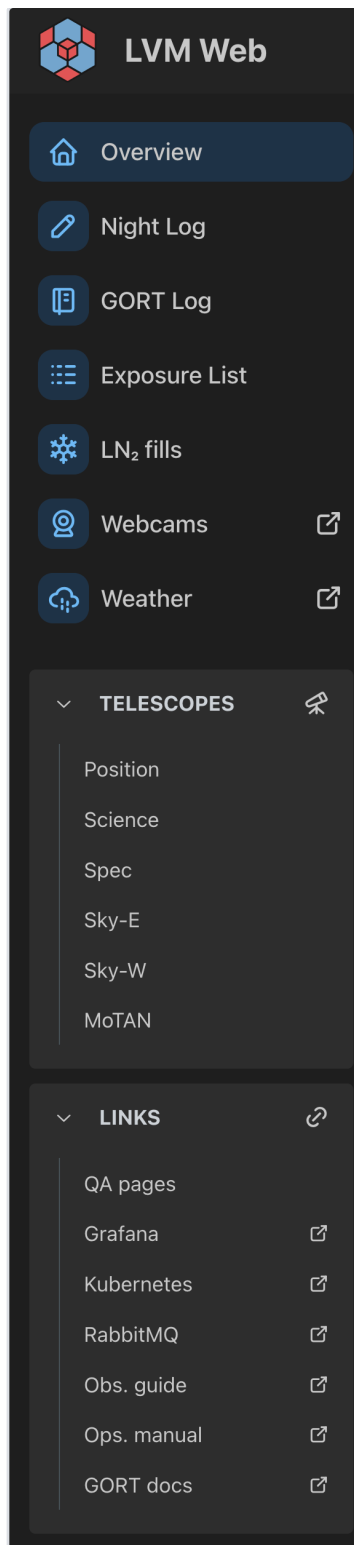
The actor status panel shows the current status of each actor. For observing they should all be deployed (meaning that they are running on the Kubernetes cluster) and ready (meaning that they are responsive and not performing any internal troubleshooting).

To the right there are two buttons to restart the actor or to stop it completely. This should only be done if the actor shows are not deployed/alive/ready or if you suspect that the actor is not behaving correctly even if it says that it is. Note that some of the actor will restart/stop together even if they show up as different elements. For example, restarting any of the `lvm.*.agcam` will restart all the auto-guidr camera actors.

The Overwatcher has an actor component that is used to command the Overwatcher (enable/disable it, allow calibrations, retrieve information about the current exposure, etc.) This can be used to completely stop the Overwatcher if it misbehaves.

Other sections

On the left side you can see a navigation bar with other pages in LVM webapp



Night log

This page shows the current night log data and comments, and the historical record of previous night logs.

This night log has not been emailed yet.

Email

Night log for 60614

TonightHistory

Observers:Overwatcher

Go to GORT log

Weather

+

Thu, 31 Oct 2024 00:50:39 GMT

Really good weather!

✎✕

Issues/bugs

+

No comments yet.

Other

+

No comments yet.

Exposures

science_tiles: 2

exp_no	obstime	type	exp_time	ra	dec	airmass	n_std	n_cam	object	lamps
28537	2024-10-30 23:08:35	flat	1.0	262.0999	-18.135655	1.556	0	9	flat	
28538	2024-10-30 23:09:39	flat	1.0	262.367128	-18.136588	1.556	0	9	flat	
28539	2024-10-30 23:10:45	flat	1.0	262.640299	-18.136734	1.556	0	9	flat	
28540	2024-10-30 23:11:48	flat	1.0	262.905742	-18.137518	1.556	0	9	flat	
28541	2024-10-30 23:12:52	flat	1.0	263.1716	-18.137872	1.556	0	9	flat	
28542	2024-10-30 23:13:56	flat	2.0	263.43814	-18.138759	1.556	0	9	flat	
28543	2024-10-30 23:15:01	flat	3.0	263.709726	-18.139379	1.556	0	9	flat	
28544	2024-10-30 23:16:06	flat	5.0	263.981884	-18.140042	1.556	0	9	flat	
28545	2024-10-30 23:17:13	flat	7.0	264.261066	-18.140568	1.556	0	9	flat	
28546	2024-10-30 23:18:22	flat	10.0	264.549359	-18.141273	1.556	0	9	flat	
28547	2024-10-30 23:19:35	flat	15.0	264.854726	-18.141601	1.556	0	9	flat	
28548	2024-10-30 23:20:52	flat	22.0	265.178452	-18.142768	1.556	0	9	flat	
28549	2024-10-30 23:42:40	arc	10.0	343.556614	-40.18985	1.059	0	9	arc	Argon,Neon,HgNe,Xenon
28550	2024-10-30 23:43:48	arc	50.0	343.841135	-40.190071	1.059	0	9	arc	Argon,Neon,HgNe,Xenon
28551	2024-10-30 23:47:38	flat	20.0	344.805121	-40.190784	1.059	0	9	flat	Quartz
28552	2024-10-30 23:54:00	flat	150.0	346.405282	-40.19188	1.059	0	9	flat	LDLS

The observers can add comments to the different sections by clicking on the + icon next to it. The comment can be edited by clicking on the small pencil icon or deleted with the X icon. The list of exposures is automatically generated. At the end of the night the observer can send the email by clicking the button at the top or bottom of the page (the night log is automatically sent at 12UT if it has not been sent before).

Previous night logs can be checked by clicking on **History** and selecting the desired MJD.

GORT Log

The log generated by GORT while observing can be viewed here. Note that this log can be very verbose.

GORT Log


☒ Auto-refresh ON

60614

1000



```
2024-10-31 00:53:22,952 - DEBUG - (spec) {'text': 'Taking agcam exposure spec-255.'}
2024-10-31 00:53:23,328 - DEBUG - (sci) {'camera_solution': {'frame': 204, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 88.4345, 'zero_point': -23.049}}
2024-10-31 00:53:23,332 - DEBUG - (sci) {'camera_solution': {'frame': 204, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 265.3347, 'zero_point': -23.088}}
2024-10-31 00:53:23,337 - DEBUG - (sci) {'measured_pointing': {'frame': 204, 'ra': 12.701874, 'dec': -71.376726, 'radec_offset': [0.173, -0.316], 'motax_offset': [-0.077, -0.077, 0.077]}}
2024-10-31 00:53:23,445 - DEBUG - (sci) {'correction_applied': {'frame': 204, 'motax_applied': [-0.076, -0.353], 'rot_applied': 0.0}}
2024-10-31 00:53:23,868 - DEBUG - (sci) {'text': 'Taking agcam exposure sci-205.'}
2024-10-31 00:53:28,276 - INFO - (spec) Last: sep=1.451 arcsec; fwhm=3.91 arcsec; mode=guide
2024-10-31 00:53:28,277 - INFO - (spec) Average (30 s): sep=1.189 arcsec; fwhm=3.9 arcsec
2024-10-31 00:53:28,644 - DEBUG - (skw) {'frame': {'seqno': 209, 'filenames': ['/data/agcam/60614/lvm.skyw.agcam.west_00000209.fits'], '/data/agcam/60614/lvm.skyw.agcam.east_00000209.fits'}, 'frame': 209, 'filenames': ['/data/agcam/60614/lvm.skyw.agcam.west_00000209.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 209, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 267.4862, 'zero_point': -23.026}}
2024-10-31 00:53:29,535 - DEBUG - (skw) {'camera_solution': {'frame': 209, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 267.4862, 'zero_point': -23.026}}
2024-10-31 00:53:29,539 - DEBUG - (skw) {'measured_pointing': {'frame': 209, 'ra': 12.06073, 'dec': -69.595842, 'radec_offset': [-0.036, 0.084], 'motax_offset': [0.009, 0.009, 0.009]}}
2024-10-31 00:53:29,543 - DEBUG - (skw) {'correction_applied': {'frame': 209, 'motax_applied': [0.009, 0.009], 'rot_applied': 0.0}}
2024-10-31 00:53:29,660 - DEBUG - (skw) {'text': 'Taking agcam exposure skyw-210.'}
2024-10-31 00:53:30,143 - DEBUG - (spec) {'frame': {'seqno': 255, 'filenames': ['/data/agcam/60614/lvm.spec.agcam.east_00000255.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 255, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 249.5374, 'zero_point': -23.076}}
2024-10-31 00:53:31,164 - DEBUG - (spec) {'measured_pointing': {'frame': 255, 'ra': 6.463515, 'dec': -71.79292, 'radec_offset': [1.427, 1.665], 'motax_offset': [-2.546, 1.242, 1.242]}}
2024-10-31 00:53:31,167 - DEBUG - (spec) {'correction_applied': {'frame': 255, 'motax_applied': [0.0, 0.0], 'rot_applied': 0.0}}
2024-10-31 00:53:31,237 - DEBUG - (spec) {'text': 'Reverting to acquisition.'}
2024-10-31 00:53:31,241 - WARNING - (spec) {'text': 'Measured offset exceeds guide tolerance.'}
2024-10-31 00:53:31,246 - WARNING - (spec) {'text': 'Reverting to acquisition.'}
2024-10-31 00:53:31,447 - DEBUG - (spec) {'text': 'Taking agcam exposure spec-256.'}
2024-10-31 00:53:32,357 - DEBUG - (skw) {'frame': {'seqno': 203, 'filenames': ['/data/agcam/60614/lvm.skye.agcam.west_00000203.fits'], '/data/agcam/60614/lvm.skye.agcam.east_00000203.fits'}, 'frame': 203, 'filenames': ['/data/agcam/60614/lvm.skye.agcam.west_00000203.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 203, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 268.9495, 'zero_point': -23.152}}
2024-10-31 00:53:33,260 - DEBUG - (skw) {'camera_solution': {'frame': 203, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 268.9495, 'zero_point': -23.152}}
2024-10-31 00:53:33,264 - DEBUG - (skw) {'measured_pointing': {'frame': 203, 'ra': 321.613188, 'dec': -44.54389, 'radec_offset': [-0.482, -0.395], 'motax_offset': [0.42, -0.42, 0.42]}}
2024-10-31 00:53:33,268 - DEBUG - (skw) {'correction_applied': {'frame': 203, 'motax_applied': [0.416, -0.471], 'rot_applied': 0.0}}
2024-10-31 00:53:33,441 - DEBUG - (skw) {'text': 'Taking agcam exposure skyw-204.'}
2024-10-31 00:53:33,873 - DEBUG - (sci) {'frame': {'seqno': 205, 'filenames': ['/data/agcam/60614/lvm.sci.agcam.east_00000205.fits'], '/data/agcam/60614/lvm.sci.agcam.west_00000205.fits'}, 'frame': 205, 'filenames': ['/data/agcam/60614/lvm.sci.agcam.east_00000205.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 205, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 88.4271, 'zero_point': -23.053}}
2024-10-31 00:53:35,028 - DEBUG - (sci) {'camera_solution': {'frame': 205, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 88.4271, 'zero_point': -23.053}}
2024-10-31 00:53:35,031 - DEBUG - (sci) {'measured_pointing': {'frame': 205, 'ra': 12.702057, 'dec': -71.37677, 'radec_offset': [-0.039, -0.159], 'motax_offset': [0.126, -0.126, 0.126]}}
2024-10-31 00:53:35,035 - DEBUG - (sci) {'correction_applied': {'frame': 205, 'motax_applied': [0.125, -0.135], 'rot_applied': 0.0}}
2024-10-31 00:53:35,159 - DEBUG - (sci) {'text': 'Taking agcam exposure sci-206.'}
2024-10-31 00:53:35,579 - DEBUG - (spec.fibsel) Moving fibre mask 500 steps.
2024-10-31 00:53:36,449 - DEBUG - (spec.fibsel) Moving fibre mask 500 steps.
2024-10-31 00:53:38,251 - INFO - (GortObserver) Moving to standard #6 (19.741831, -71.115126, 0.000) on fibre P1-9.
2024-10-31 00:53:38,364 - DEBUG - (GortObserver) Re-slewing 'spec' telescope.
2024-10-31 00:53:38,365 - INFO - (spec) Stopping guider.
2024-10-31 00:53:38,395 - INFO - (spec) Moving to ra=19.242482 dec=-71.142406.
2024-10-31 00:53:39,018 - DEBUG - (spec) {'text': 'The guide loop has finished.'}
2024-10-31 00:53:40,148 - DEBUG - (skw) {'frame': {'seqno': 210, 'filenames': ['/data/agcam/60614/lvm.skyw.agcam.west_00000210.fits'], '/data/agcam/60614/lvm.skyw.agcam.east_00000210.fits'}, 'frame': 210, 'filenames': ['/data/agcam/60614/lvm.skyw.agcam.west_00000210.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 210, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 267.4627, 'zero_point': -22.992}}
2024-10-31 00:53:41,049 - DEBUG - (skw) {'camera_solution': {'frame': 210, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 267.4627, 'zero_point': -22.992}}
2024-10-31 00:53:41,055 - DEBUG - (skw) {'measured_pointing': {'frame': 210, 'ra': 12.060913, 'dec': -69.59512, 'radec_offset': [-0.141, 0.365], 'motax_offset': [0.021, 0.021, 0.021]}}
2024-10-31 00:53:41,059 - DEBUG - (skw) {'correction_applied': {'frame': 210, 'motax_applied': [0.02, 0.307], 'rot_applied': 0.0}}
2024-10-31 00:53:41,217 - DEBUG - (skw) {'text': 'Taking agcam exposure skyw-211.'}
2024-10-31 00:53:41,646 - DEBUG - (skw) {'text': 'Taking agcam exposure skyw-211.'}
2024-10-31 00:53:43,583 - DEBUG - (GortObserver) Starting to guide on spec telescope.
2024-10-31 00:53:43,584 - INFO - (spec) Guiding at RA=19.741831, Dec=-71.115126, pixel=(1928.8, 853.4).
2024-10-31 00:53:44,041 - DEBUG - (skw) {'frame': {'seqno': 204, 'filenames': ['/data/agcam/60614/lvm.skye.agcam.west_00000204.fits'], '/data/agcam/60614/lvm.skye.agcam.east_00000204.fits'}, 'frame': 204, 'filenames': ['/data/agcam/60614/lvm.skye.agcam.west_00000204.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 204, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 268.9522, 'zero_point': -23.156}}
2024-10-31 00:53:44,388 - DEBUG - (spec) {'text': 'Taking agcam exposure spec-257.'}
2024-10-31 00:53:44,950 - DEBUG - (skw) {'camera_solution': {'frame': 204, 'camera': 'west', 'solved': True, 'wcs_mode': 'gaia', 'pa': 268.9522, 'zero_point': -23.156}}
2024-10-31 00:53:44,954 - DEBUG - (skw) {'measured_pointing': {'frame': 204, 'ra': 321.612733, 'dec': -44.543141, 'radec_offset': [0.685, -0.212], 'motax_offset': [-0.745, -0.745, -0.745]}}
2024-10-31 00:53:44,958 - DEBUG - (skw) {'correction_applied': {'frame': 204, 'motax_applied': [-0.737, -0.084], 'rot_applied': 0.0}}
2024-10-31 00:53:45,539 - DEBUG - (skw) {'text': 'Taking agcam exposure skyw-205.'}
2024-10-31 00:53:45,743 - DEBUG - (sci) {'frame': {'seqno': 206, 'filenames': ['/data/agcam/60614/lvm.sci.agcam.east_00000206.fits'], '/data/agcam/60614/lvm.sci.agcam.west_00000206.fits'}, 'frame': 206, 'filenames': ['/data/agcam/60614/lvm.sci.agcam.east_00000206.fits'], 'flavour': 'object', 'n_sources': 22, 'camera_solution': {'frame': 206, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 88.4195, 'zero_point': -23.055}}
2024-10-31 00:53:46,641 - DEBUG - (sci) {'camera_solution': {'frame': 206, 'camera': 'east', 'solved': True, 'wcs_mode': 'gaia', 'pa': 88.4195, 'zero_point': -23.055}}
2024-10-31 00:53:46,646 - DEBUG - (sci) {'measured_pointing': {'frame': 206, 'ra': 12.701927, 'dec': -71.376902, 'radec_offset': [0.112, 0.325], 'motax_offset': [-0.299, 0.299, 0.299]}}
2024-10-31 00:53:46,650 - DEBUG - (sci) {'correction_applied': {'frame': 206, 'motax_applied': [-0.296, 0.265], 'rot_applied': 0.0}}
2024-10-31 00:53:46,762 - DEBUG - (sci) {'text': 'Taking agcam exposure sci-207.'}
2024-10-31 00:53:47,188 - DEBUG - (sci) {'text': 'Taking agcam exposure sci-207.'}
```

The log refreshes every 30 seconds unless the auto-refresh is disabled (at any time the log can be refreshed by clicking on the  icon. By default the log only shows the last 1,000 lines to speed rendering but more lines, or then entire file, can be shown. It's also possible to see the log from any previous MJD.

Exposure list

Exposure List

60614



Exp #	MJD	Obs. time	Type	Exp. time	RA (sci)	Dec (sci)	Airmass	Lamps	# std	# cameras	Object
28537	60614	23:08:35.703	flat	1	262.0999	-18.135655	1.556		0	9	flat
28538	60614	23:09:39.680	flat	1	262.367128	-18.136588	1.556		0	9	flat
28539	60614	23:10:45.153	flat	1	262.640299	-18.136734	1.556		0	9	flat
28540	60614	23:11:48.822	flat	1	262.905742	-18.137518	1.556		0	9	flat
28541	60614	23:12:52.361	flat	1	263.1716	-18.137872	1.556		0	9	flat
28542	60614	23:13:56.172	flat	2	263.43814	-18.138759	1.556		0	9	flat
28543	60614	23:15:01.122	flat	3	263.709726	-18.139379	1.556		0	9	flat
28544	60614	23:16:06.454	flat	5	263.981884	-18.140042	1.556		0	9	flat
28545	60614	23:17:13.355	flat	7	264.261066	-18.140568	1.556		0	9	flat
28546	60614	23:18:22.177	flat	10	264.549359	-18.141273	1.556		0	9	flat
28547	60614	23:19:35.485	flat	15	264.854726	-18.141601	1.556		0	9	flat
28548	60614	23:20:52.763	flat	22	265.178452	-18.142768	1.556		0	9	flat
28549	60614	23:42:40.191	arc	10	343.556614	-40.18985	1.059	Argon, Neon, HgNe, Xenon	0	9	arc
28550	60614	23:43:48.182	arc	50	343.841135	-40.190071	1.059	Argon, Neon, HgNe, Xenon	0	9	arc
28551	60614	23:47:38.542	flat	20	344.805121	-40.190784	1.059	Quartz	0	9	flat
28552	60614	23:54:00.769	flat	150	346.405282	-40.19188	1.059	LDLS	0	9	flat
28553	60614	23:58:03.452	bias	0	224.828239	9.639782	-3.542		0	9	bias
28554	60614	23:58:58.412	bias	0	225.057643	9.639394	-3.542		0	9	bias
28555	60614	23:59:53.419	bias	0	225.287661	9.639004	-3.542		0	9	bias
28556	60614	00:00:48.337	bias	0	225.517396	9.638647	-3.542		0	9	bias
28557	60614	00:01:43.496	bias	0	225.748197	9.638219	-3.542		0	9	bias
28558	60614	00:02:38.853	bias	0	225.978932	9.637832	-3.542		0	9	bias
28559	60614	00:03:34.087	bias	0	226.210661	9.637398	-3.542		0	9	bias
28560	60614	00:15:58.558	object	900	12.786357	-71.379657	1.481		12	9	tile_id=1028331
28561	60614	00:31:57.311	object	900	12.782551	-71.382796	1.455		12	9	tile_id=1028331

Shows a table with information about each exposure taken during the night. The log can be refreshed manually but it auto-refreshes every minute. It defaults to the current night but, as with the other sections, it's possible to select which MJD to show.

LN₂ fill log

Shows the log for a give LN₂ fill. The fills are labeled by the time at which the process started running.

LN₂ fill log

Status: succeeded

2024-10-30 22:00:01

Event times

Event	Time
Start time	22:00:01
End time	22:30:39
Purge start	22:00:09
Purge complete	22:26:15
Fill start	22:26:16
Fill complete	22:30:38

Valve open/close times

Valve	Open	Close	Elapsed (s) ?	Thermistor (s) ?	Timeout?
purge	22:00:09	22:26:15	1566	1565	
b1	22:26:18	22:29:34	197	196	
r1	22:26:18	22:28:58	161	160	
z1	22:26:18	22:29:38	201	200	
b2	22:26:18	22:30:22	245	244	
r2	22:26:18	22:30:14	237	236	
z2	22:26:18	22:30:38	260	259	
b3	22:26:18	22:29:35	198	197	
r3	22:26:18	22:29:34	197	196	
z3	22:26:18	22:30:16	239	238	

Log

```
2024-10-30 22:00:01.3 - INFO - Using configuration file: /home/sdss5/config/software/lvmcryo/lvmcryo.yaml
2024-10-30 22:00:01.3 - DEBUG - Running purge-and-fill with configuration:
{
  "action": "purge-and-fill",
  "cameras": [
    "r1",
    "r2",
    "r3",
    "b1",
    "b2",
    "b3",
    "z1",
    "z2",
    "z3"
  ],
  "interactive": "no",
  "no_prompt": true,
  "dry_run": false,
  "use_thermistors": true,
  "require_all_thermistors": false,
  "check_pressures": true,
  "check_temperatures": true,
  "max_pressure": 0.001,
  "max_temperature": -140.0,
  "purge_time": null,
  "min_purge_time": 1200.0,
}
```

Weather

Opens a new tab with the LCO weather page.

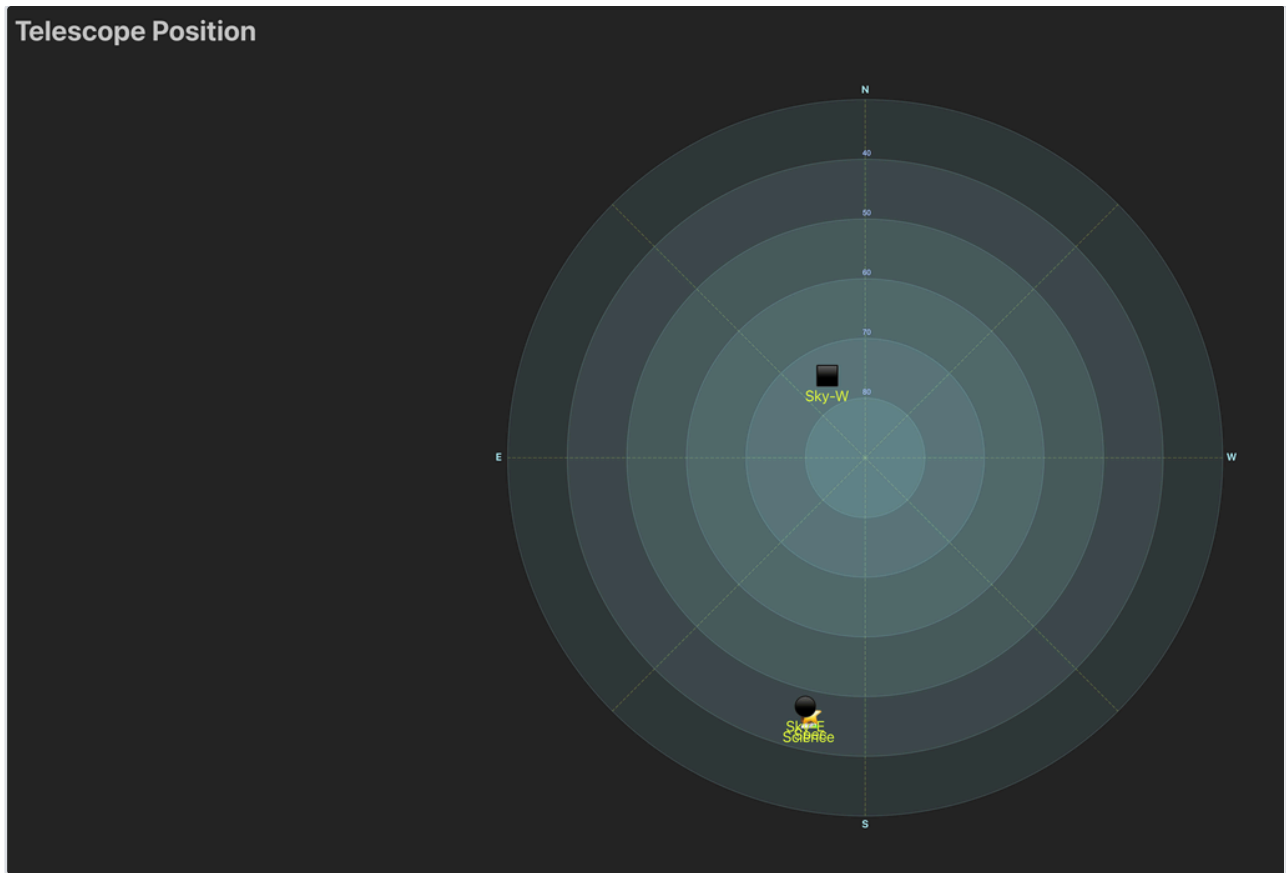
Webcams

Opens the webpage with the LVM webcams. This requires having an SSH connection to the LVM servers and forwarding `camaras-02.lco.cl:443` to `localhost:18888`.

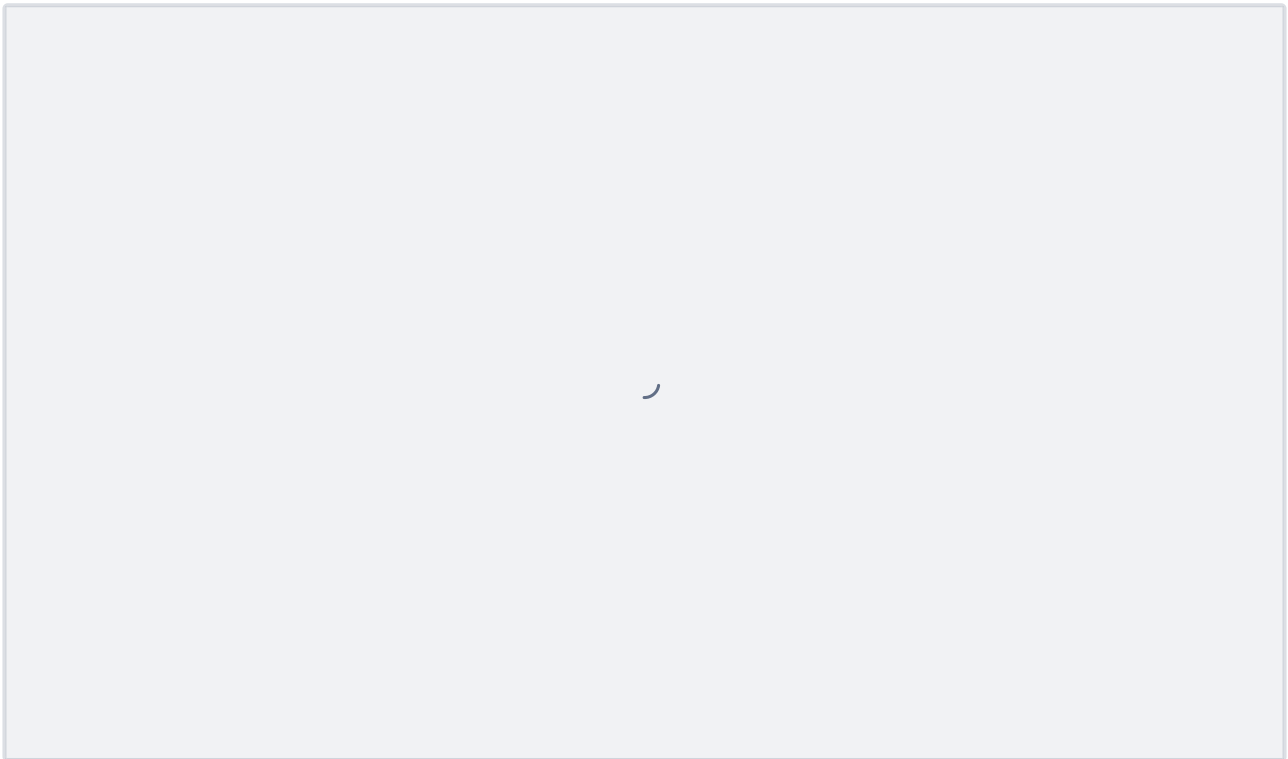
Telescopes

Several pages that show information about the telescope system. The *Position* is similar to the Telescope panel in the overview page and shows the current position of each telescope in an alt-az plot.

Telescope Position



The remaining sections show VNC connections to the telescope PlaneWave mount interface the TwiceAsNice GUI, e.g.,



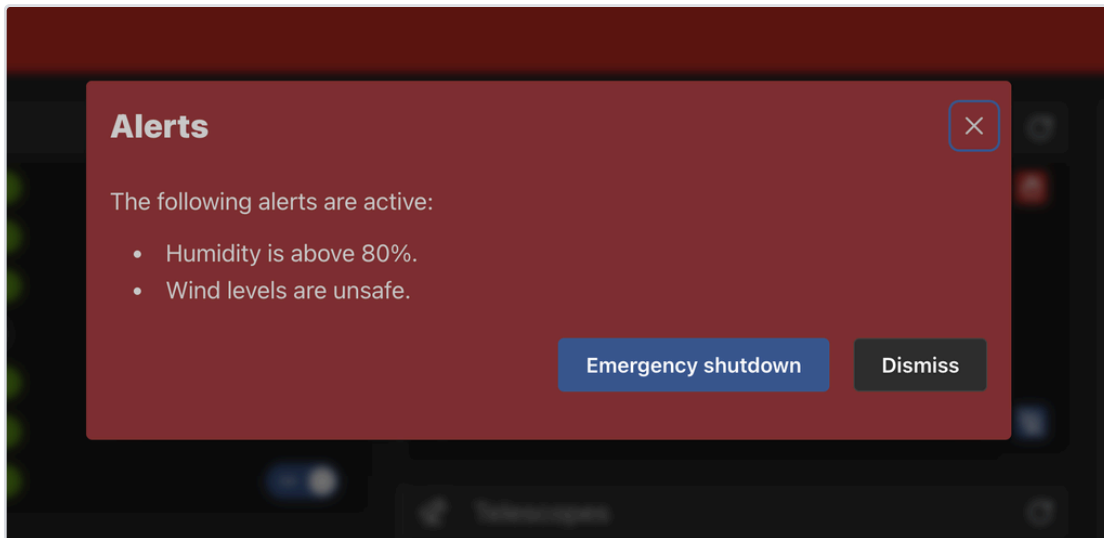
These interfaces require forwarding the LVM port `10.8.38.21:8090` to `localhost:8090`. In general these pages should only be accessed for troubleshooting.

Links


These are just a collection of useful links to metrology tools (e.g., Grafana) and different pieces of documentation.

Alerts and emergency shutdown


When there are alerts in the system, be that because of hardware issues or weather conditions, LVM webapp will show a window with the current alerts.




When the alerts are received you can dismiss the notification or trigger an emergency shutdown which will close the dome and park the telescopes (there are few differences between just closing the dome and an emergency shutdown, but the later will override some safety conditions).

If you dismiss the alerts the header of the webapp will remain red for as long as the alerts are active. You can reopen the alerts window by clicking on the small exclamation point icon  on the top right section of the page



You can also trigger a shutdown at any point (with or without alerts) by clicking on the *Shutdown* button. During normal conditions the page shows a green check icon .

Observing with the Overwatcher

 Some details in this section, such as the sequence and timing of the calibrations are subject to changes.

The Overwatcher is designed to take over the entire observing process so the steps to observe with it are very straight-forward.

- 30 minutes before the sunset the Overwatcher will home the telescopes, perform some checks, and take a bias. This sequence happens even if the Overwatcher is disabled. If there is a problem with the sequence a critical alert is issues to give observers time to solve the issues before calibrations.
- About 15 minutes before the evening sunset (or earlier if the conditions are good) enable the Overwatcher by clicking on the switch on the [Overwatcher panel](#) in the LVM webapp. Confirm that `YES` appears on the `Enabled` section. Also confirm that the calibrations are allowed.
- Approximately 7 minutes before the sunset, if the conditions are still safe, the Overwatcher will open the dome. 2 minutes before the sunset it will take twilight flats (`twilight_flats_sunset`). Once it finishes taking all 12 exposures it will close the dome.
- 30 minutes after sunset the Overwatcher will run the `quick_cals` and `bias_sequence` calibration scripts.

- A few minutes before the 15 degree twilight, the dome will open. Once the twilight is reached the focus sequence will be run and then the Overwatcher will start the observing loop.
- The Overwatcher will continue observing tiles throughout the night. Every hour it will run a focus sweep. If at any point the conditions become unsafe the Overwatcher will cancel the loop and close the dome. If the conditions become safe again, it will reopen, refocus, and restart the loop.
- When the morning twilight is reached, the Overwatcher will decide whether to cancel the current exposure. If fewer than 5 minutes remain in the exposure it will complete it and then cancel the loop. Otherwise it will cancel the exposure immediately. The Overwatcher will then close the dome.
- 20 minutes before the sunset it will open the dome again and take the morning twilight flats (`twilight_flats_sunrise`). It will then close the dome.
- At 12UT (this is always after the sunset at any time of the year) a cronjob process will perform some safety checks: it will close the dome if it's open, perform a cleanup of the system, turn off any calibration lamps, etc. It will also send the night log if it has not been sent before and will disable the Overwatcher if it's not already disabled.

During the night you can add notes to the [night log page](#) with comments on the weather, issues found, etc. You can manually send the log at the end of the night by clicking on the send button on the page or leave it unsent and the 12UT cronjob will send it for you. You can also check the [GORT log](#) page for additional details on what the system is doing, especially if there are issues.

i The Overwatcher runs in the background in the LVM servers. You can have as many LVM webapp browser windows open as you want. Closing them won't affect the Overwatcher. Similarly, you can open or close VNC connections to the LVM observer machine without that affecting the Overwatcher.

Current limitations

- The Overwatcher response to variable weather conditions, for example passing clouds, is very simple at this point. If tile acquisition fails it will disable that tile and keep trying to observe another one. It will do this even if the transparency is really low and data quality is bad as long as the conditions are safe. If you feel that it's not worth trying to observe, disable the Overwatcher (you can choose to manually close the dome at this point) and enable it back only when the conditions improve. You can check with the du Pont observers on Slack to get a better sense of the conditions. We expect to have the Overwatcher handle these conditions better soon.
- If you disable the Overwatcher that will not close the dome as long as conditions are good. The Overwatcher only closes the dome after twilight flat calibrations or when the observing loop reaches the morning twilight. It's not trivial to decide when a user may want to stop the Overwatcher but keep the dome open to do some manual intervention and when they want to close the dome. If you want to close the dome, do it manually once the Overwatcher is disabled by clicking on the close dome button on the [enclosure panel](#). This may change in the future.
- Currently the Overwatcher won't try to take long-term, monthly calibrations. Those still need to be run manually.

Du Pont observers' responsibilities

⚠ The agreed upon responsibilities of the du Pont observers with LVM will change as we transition from LVM remote observers to fully robotic. This section describes what we expect from the du Pont observers at this time.

In this phase of LVM robotic observing we expect to have remote observers monitoring the system for the majority of the night, but there may be periods of time when no LVM observer is monitoring observations. For those periods, as well as for emergencies, we rely on the du Pont observers to safeguard the facility (with survey efficiency being secondary).

Here is what we expect the du Pont observers will help us with:

- Throughout the night, LVM observers may reach to the du Pont observers at the `#lvm-dupont-observing` Slack channel to ask about weather or transparency conditions. Please respond in a timely manner depending on your other priorities.
- Keep the LVM webapp overview page on a screen in the du Pont control room. Keep an eye on it. We are not asking for continuous monitoring, but if you see something weird, especially alerts (those should be very obvious) feel free to contact us on Slack to confirm


that something is being done.

- In the middle of the night, the early-night LVM observer may inform you that they are leaving and that the late-night observer won't connect for 1-2 hours. **If you are busy and cannot monitor LVM during that time, let the LVM observer know so they can close the dome and run calibrations.** Otherwise please keep a closer look on the LVM webapp (if weather conditions are safe, it's enough to check the webapp every 10 minutes). If you see errors on the overview page or you feel the weather conditions are unsafe (and definitively if you close the du Pont), [disable the overwatcher](#) and run an [emergency shutdown](#). Don't worry about reopening. Make sure the Overwatcher is disabled (the emergency shutdown should turn it off) to prevent that it could re Please let us know if this happens on `#lvm-dupont-observing`
- If conditions change, especially for conditions that can involve risk to the equipment (high wind or humidity, condensation, etc.) please let the LVM observer now on Slack. If you have closed du Pont due to bad weather and LVM is still open, please contact the LVM observer. **If the LVM observer does not respond in 1-2 minutes and you think the situation is serious, please close LVM but running an emergency shutdown.** Don't worry about additional alarms or other errors but make sure the webapp indicates that the dome is closed. If possible, check the webcams to make sure the dome has closed. Please be aggressive about this; we much prefer you closing us out of precaution than staying open in potentially bad conditions.
- If at any point you need to close the dome and that fails, please go to the LVM enclosure and follow the instructions to manually close the dome. If that also fails please alert the on-site engineers. Let us know on Slack or over email that the problem exists, but it's very unlikely that we can do anything remotely if the manual closing does not work, so contacting the LCO engineers is the priority, especially if the conditions are unsafe.
- At the end of the night, when you are ready to leave du Pont, please check with the LVM observer and confirm that there is an observer and they will continue observing after you leave. If nobody responds in a few minutes and LVM is open and observing:
 - [Disable the Overwatcher](#) (on the pop-up window select immediately).
 - Perform an emergency shutdown and confirm that the dome has closed.
 - Let us know on Slack that you closed LVM.
- On your way back to the residence, as you pass by the LVM enclosure, please confirm that it's closed (unless you have confirmed that an LVM observer is still observing).
- Support for LVM is secondary to your main responsibilities as du Pont observers. If at any point you think that you cannot monitor LVM appropriately (for example if you are the only observer that night or if all the observers are busy with engineering troubleshooting) please let the LVM observer know so that they can plan accordingly. If there is no LVM observer, disable and close LVM for the night.
- **If at any point you think that there is any potential risk to the LVM enclosure, close the dome first and let us know later.**

F.A.Q.s and troubleshooting

The Overwatcher is misbehaving, what do I do?

If the Overwatcher is not doing what it's supposed to do first try to disable it (if necessary, make it stop the current observation immediately) and then run a cleanup from the Overwatcher panel in the LVM webapp. Check the logs to make sure that after this it's not doing anything else. Then you can try re-enabling the Overwatcher.

If the Overwatcher fails to stop or keeps doing weird things, completely kill it by clicking on the  icon on `lvm.overwatcher` on the actor status panel. After that do a cleanup if necessary. Then you can close the dome or you can resume observations manually by connecting to the VNC machine and using GORT from an IPython terminal.

I cannot enable the Overwatcher, the switch won't change

Make sure you are [authenticated](#) and that the lock icon is white. The lock authentication password is **NOT** the usual SDSS-V password.

I want or need to go back to manual observing

To go back to manual observing (from the VNC session, using an IPython terminal, or for example to run the long-term calibrations):

- Disable the Overwatcher (after the current tile or immediately depending on the conditions and urgency). Confirm that it has stopped observing.
- Manually close the dome if necessary.
- *Disallow calibrations*. This will prevent the Overwatcher running safe calibrations (calibrations that do not require operating the dome) while you're otherwise observing.

Then go to the IPython terminal and start observing manually. Note that you'll need to start GORT with `g = await`


`Gort(override_overwatcher=True, verbosity='debug').init()` (more details [here](#))

GORT complains that the Overwatcher is running

If you try to initialise an instance of `Gort()` (e.g., `g = await Gort(verbosity='debug').init()`) while the Overwatcher is running (even if it is disabled) you'll get an error

```
1 GortError: Error 6 (OVERATCHER_RUNNING): overwatcher is running. If you really want to use GORT initialise it
  with Gort(override_overwatcher=True).
```

This is designed to prevent the user and the Overwatcher fighting for the same hardware. If you really want to use the GORT library, you have two options:

- Completely kill the Overwatceher by clicking on the  icon on `lvm.overwatcher` on the actor status panel in the webapp.
- Initialise GORT with `g = await Gort(override_overwatcher=True, verbosity='debug').init()` You will get a warning but otherwise GORT will behave normally. Before this, make sure the [Overwatcher is disabled and that calibrations are not allowed](#).

Should I send the old-style log?

If possible, please fill out the log in the webapp and send it from there at the end of the night. You can decide to keep the spreadsheet log and link it with a comment in the log, but that's probably not necessary.

