Las Cumbres Observatory

Python and Robotic Telescopes

Edward Gomez

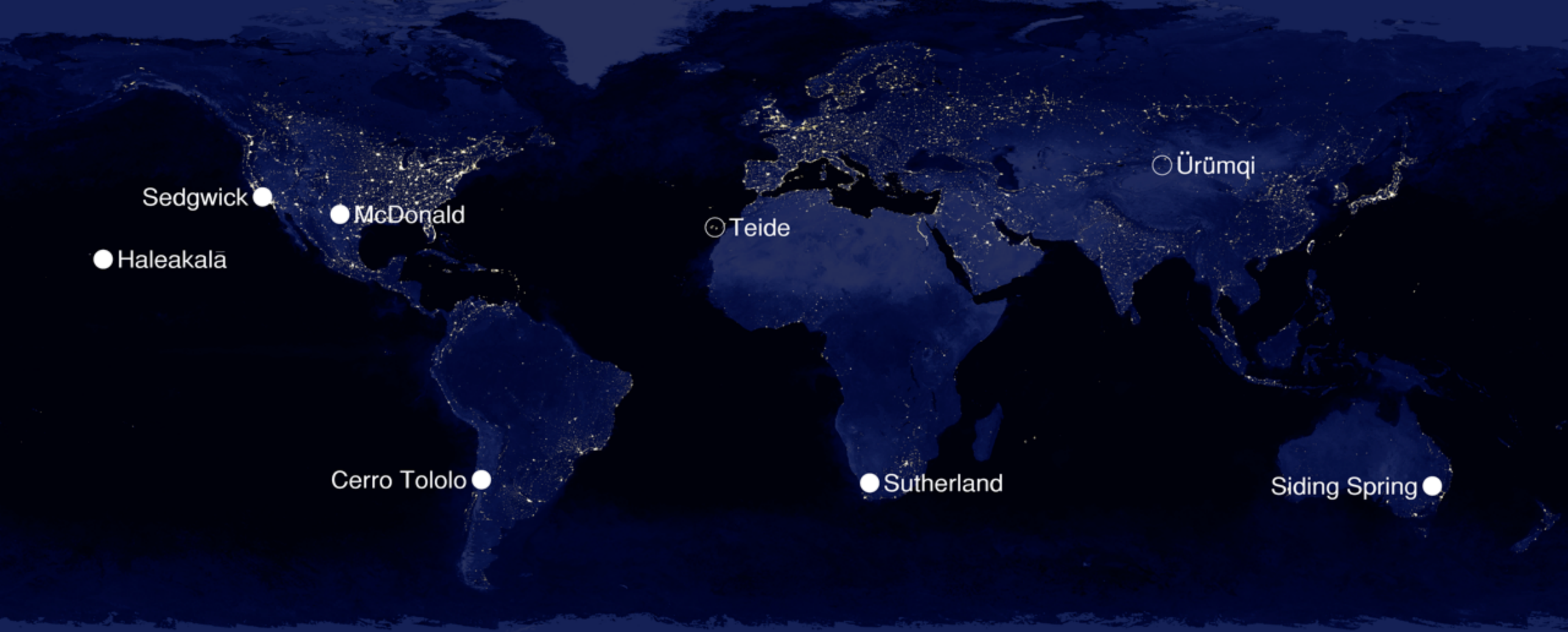

2m telescopes x 2


1m telescopes x 10
Santa Barbara, California : Headquarters


0.4m telescopes x 5

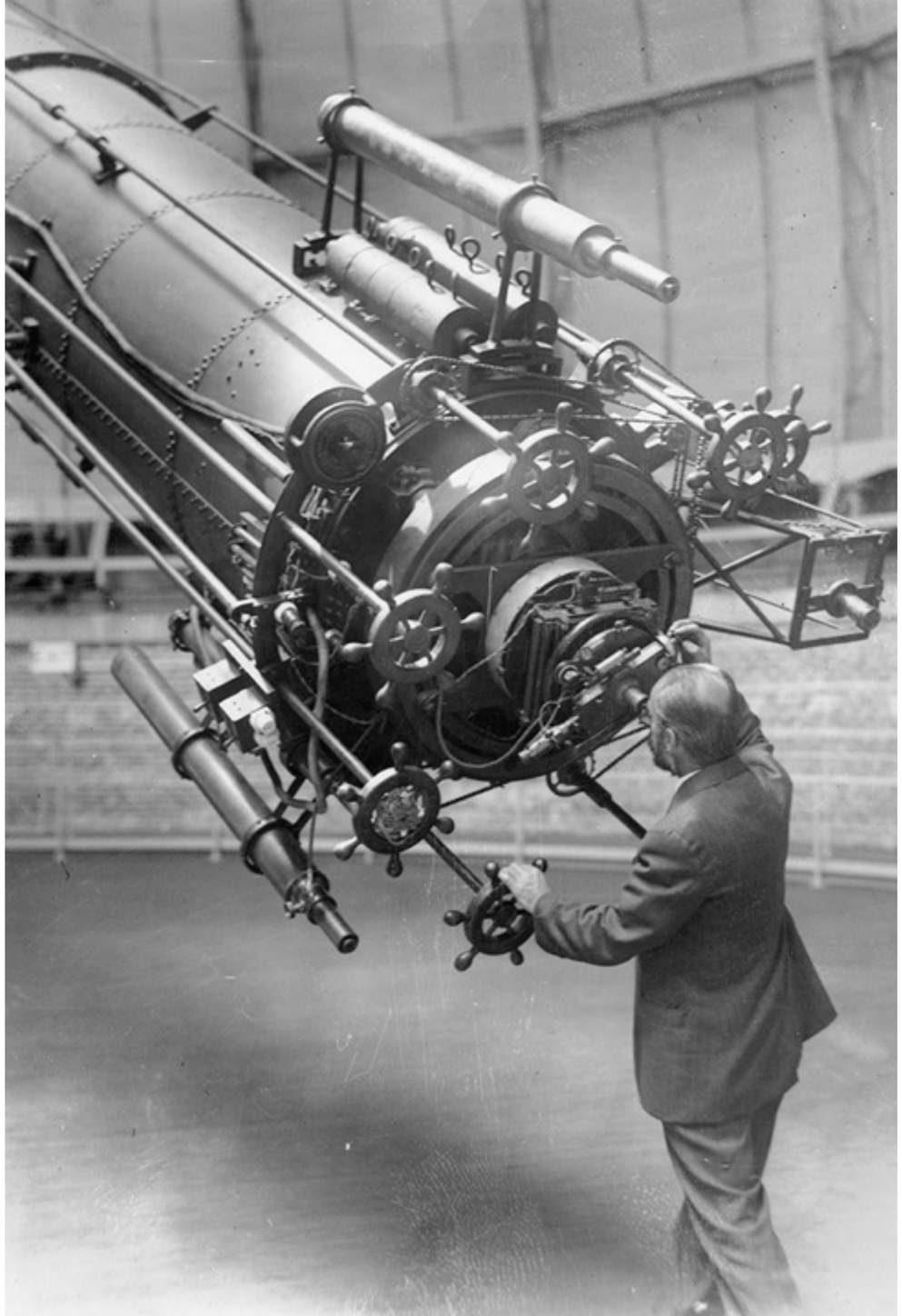
Siding Spring, Australia

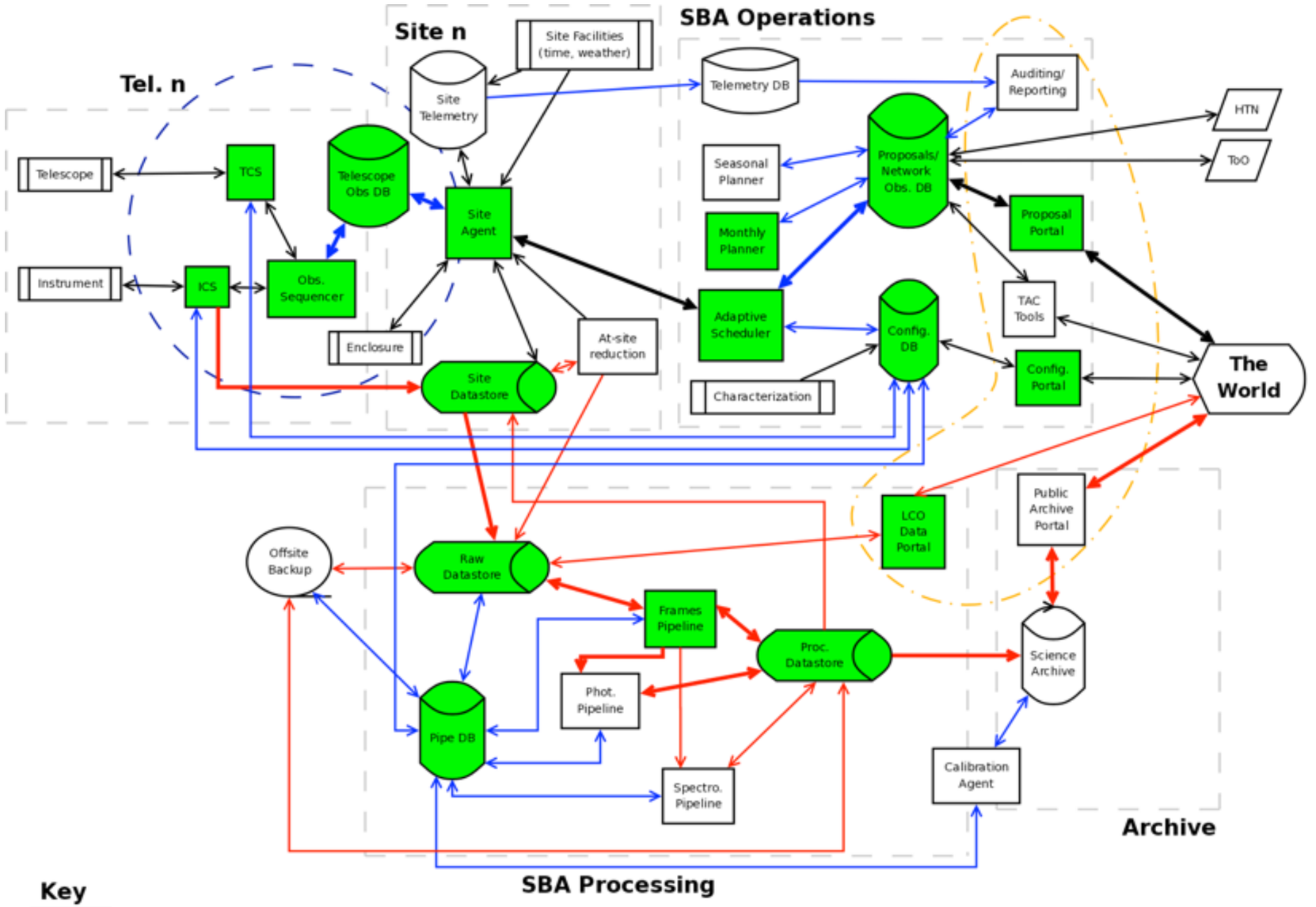

Cerro Tololo, Chile



12 telescopes
currently operating

Time Domain
Astrophysics




Site n
Site Facilities (time, weather)
SBA Operations
Tel. n
Site Telemetry
Telemetry DB
Auditing/ Reporting
HTN
ToO
Telescope
TCS
Telescope Obs DB
Site Agent
Seasonal Planner
Proposals/ Network Obs. DB
Monthly Planner
Proposal Portal
Instrument
ICS
Obs. Sequencer
Adaptive Scheduler
Config. DB
TAC Tools
Enclosure
At-site reduction
Config. Portal
The World
Site Datastore
Characterization
LCO Data Portal
Public Archive Portal
Offsite Backup
Raw Datastore
Frames Pipeline
Proc. Datastore
Science Archive
Phot. Pipeline
Pipe DB
Calibration Agent
Spectro. Pipeline
Archive
SBA Processing
Key
Software
Publish/subscribe
LCOGT Website/wrapper
(Shaded boxes indicate required for Version 0.5)
External entity
External input
Science data
DB connection
Other connection
(Thick lines indicate "normal" astronomy flow ("Proposals to Papers")
Diagram version: 0.9.1 (FBD 20090211)

Key

Software

Publish/subscribe

LCOGT Website/wrapper

(Shaded boxes indicate required for Version 0.5)

External entity

External input

Science data

DB connection

Other connection

(Thick lines indicate "normal" astronomy flow ("Proposals to Papers")

Diagram version: 0.9.1 (FBD 20090211)

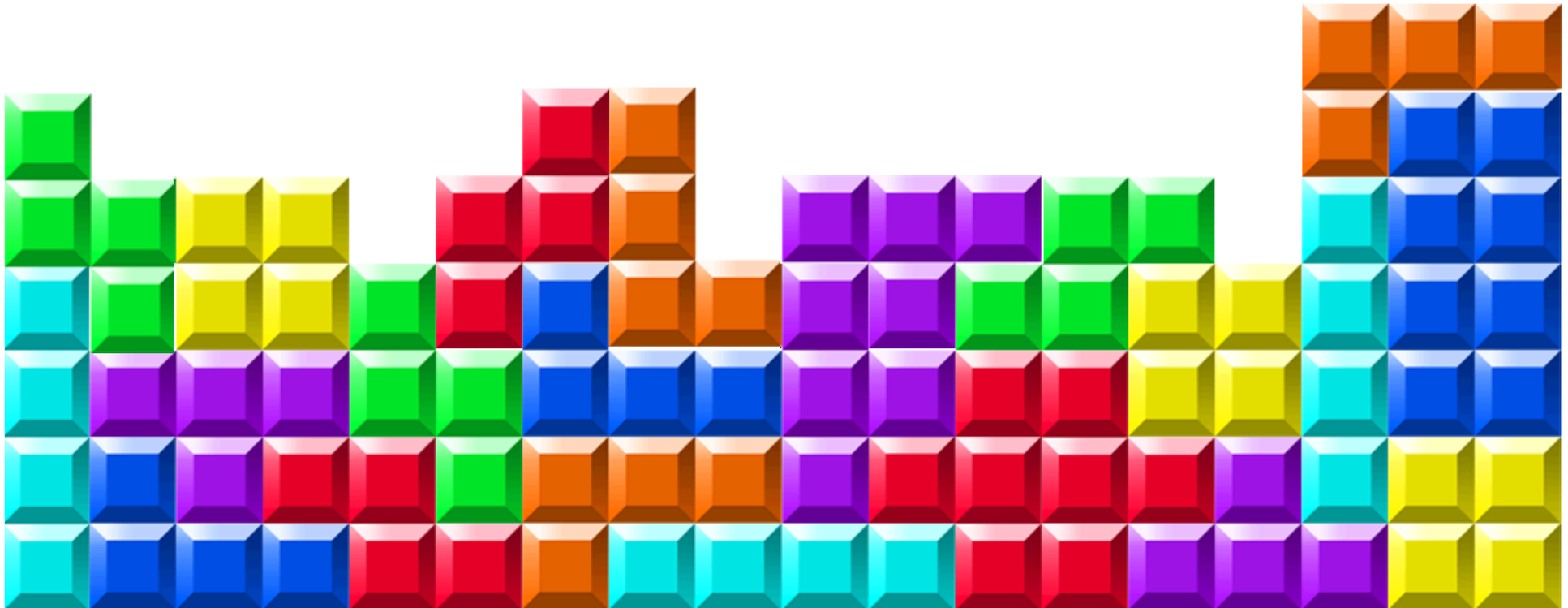
Adding to the schedule

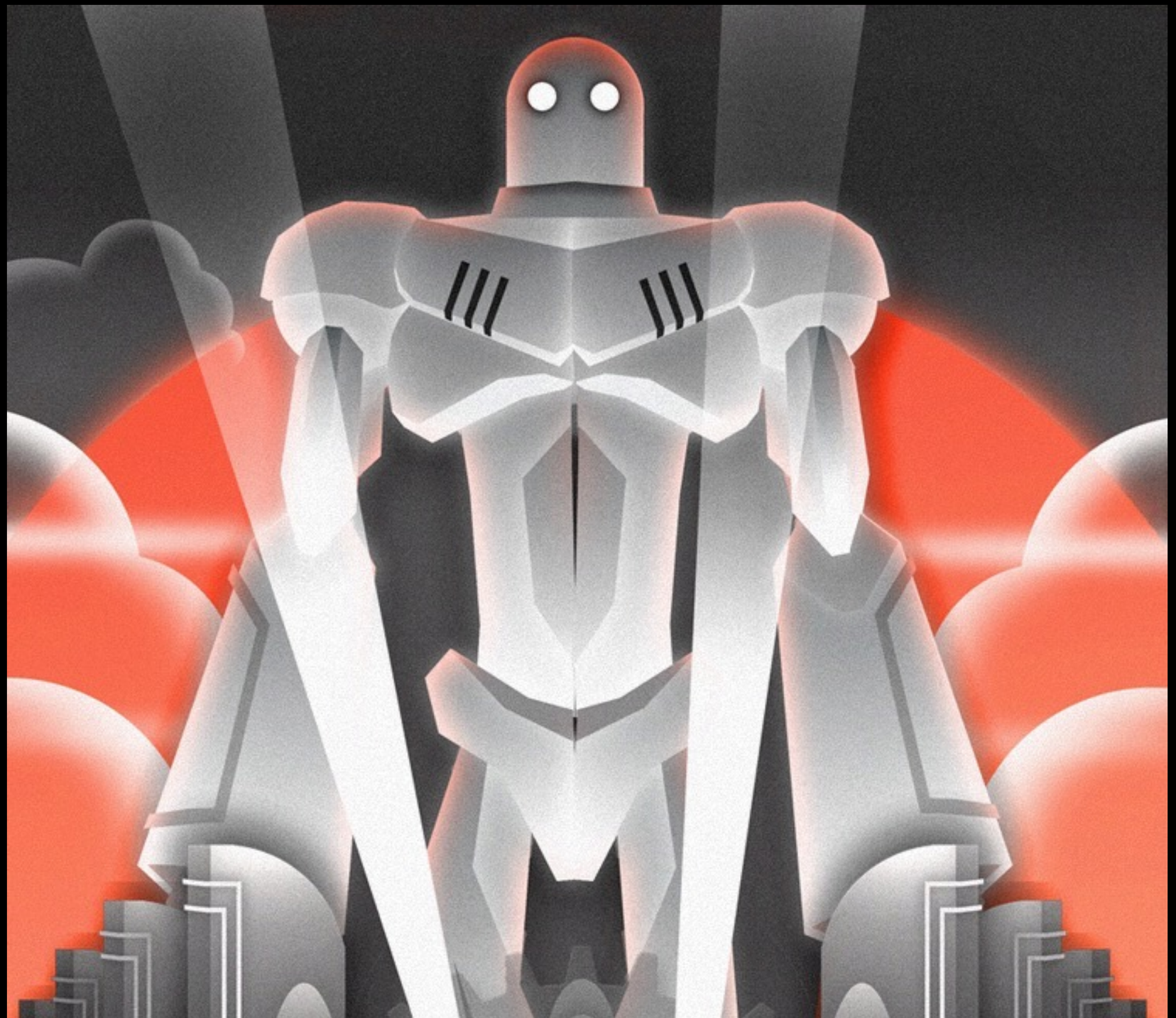
```
from datetime import datetime
from lcogtpond import block, molecule, pointing
```

```
block_params = {
    'start' : datetime( 2014, 2, 19, 5, 0, 0, 0 ),
    'end'   : datetime( 2014, 2, 19, 7, 20, 0, 0 ),
    'site' : 'elp',
    'observatory' : 'doma',
    'telescope' : '1m0a'
    }

my_block = block.Block.build(**block_params)

target = {
            'name'  : 'WASP-13b',
            'RA'    : 140.1042,
            'Dec'   : 33.8825,
            'exp'   : 40,
            'filter': ['ip'],
            'count' : 0 }
        }

ra_dec_sid_target = pointing.sidereal(**target)

expose_params = {
    'inst_name'  : 'kb16',
    'filters'    : 'ip',
    'exp_time'   : 50,         #exposure in sec
    'bin'        : 2,          #binning
    'pointing'   : ra_dec_sid_target,
    'priority'   : 10
}

expose = molecule.Expose.build(**expose_params)
my_block.add_molecule(expose)
my_block.save()
```

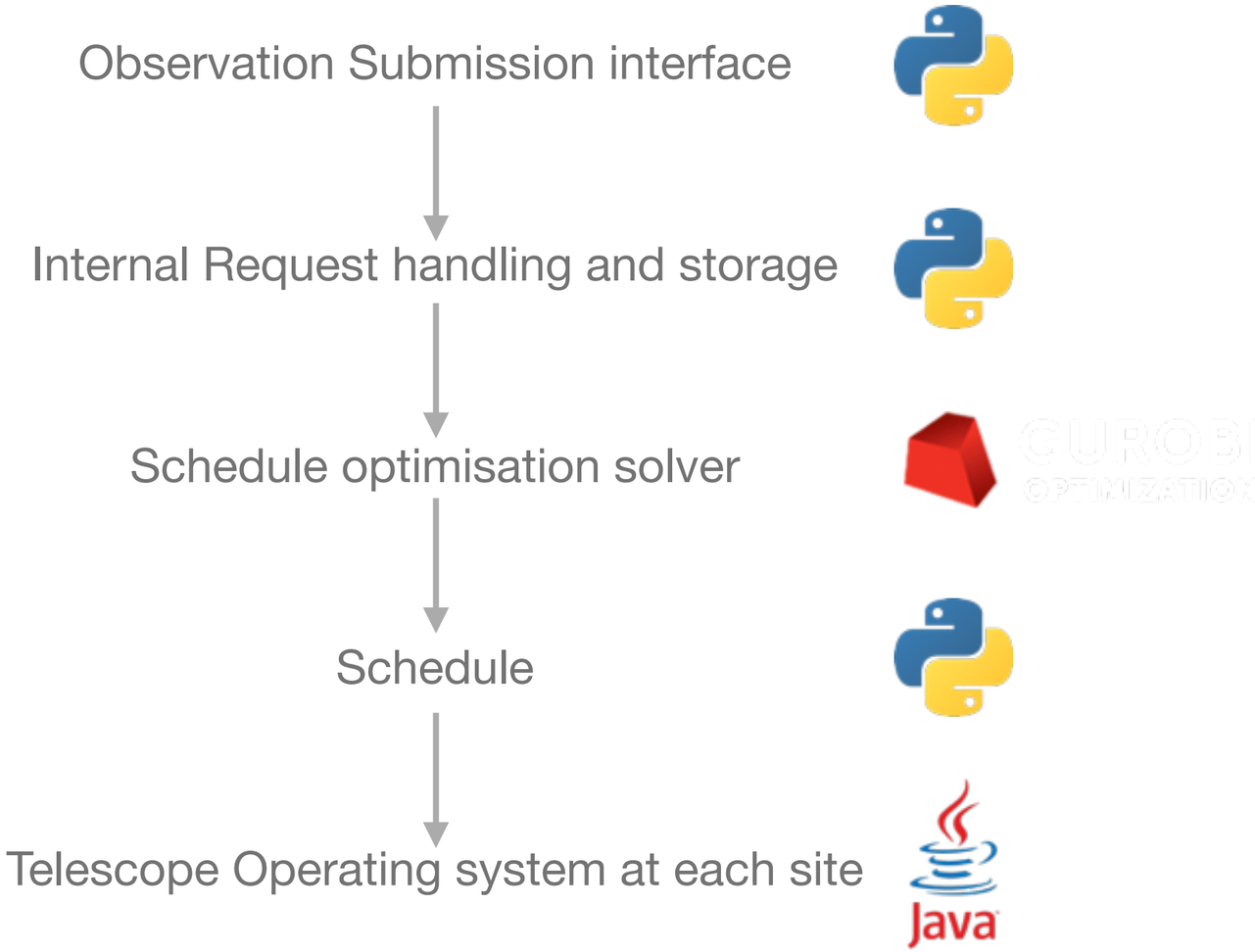
~1000 active users

Robotic Autonomous Scheduler

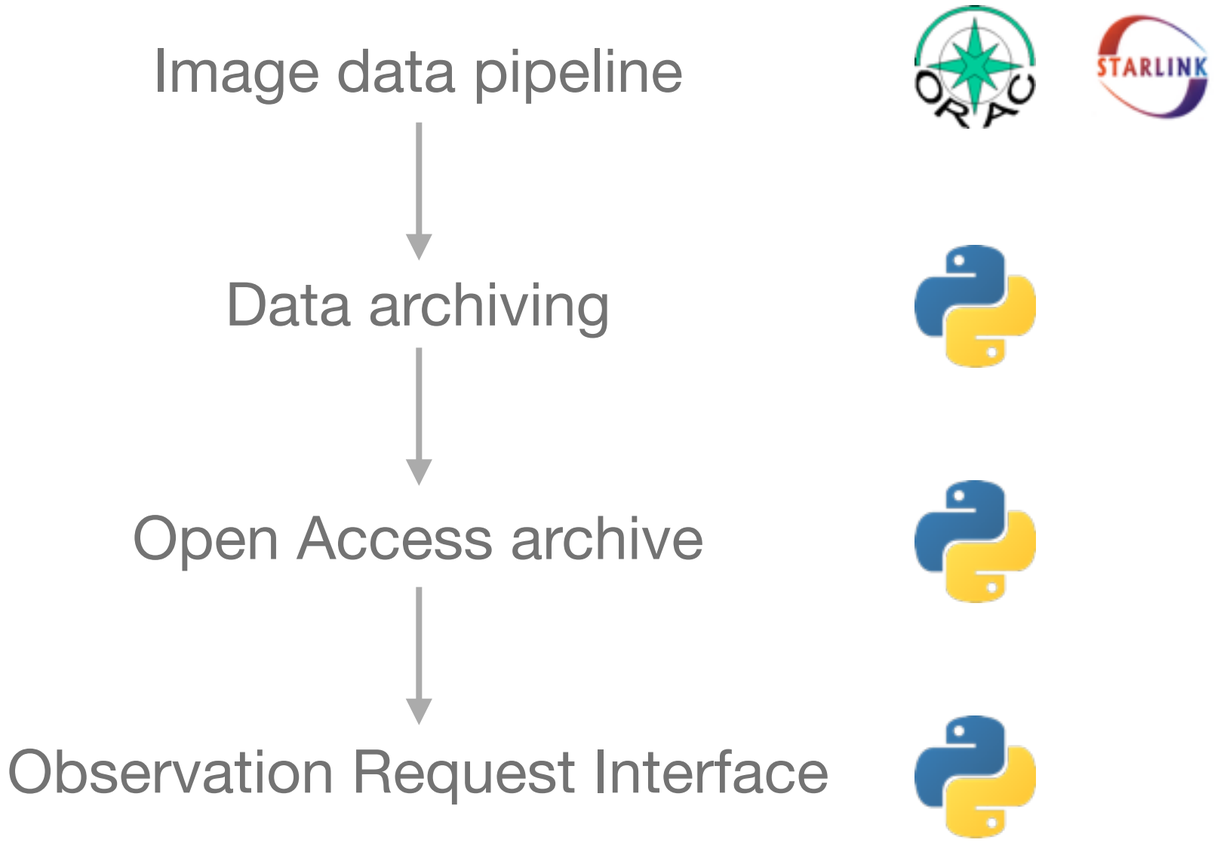




Observing with LCOGT



Observing with LCOGT

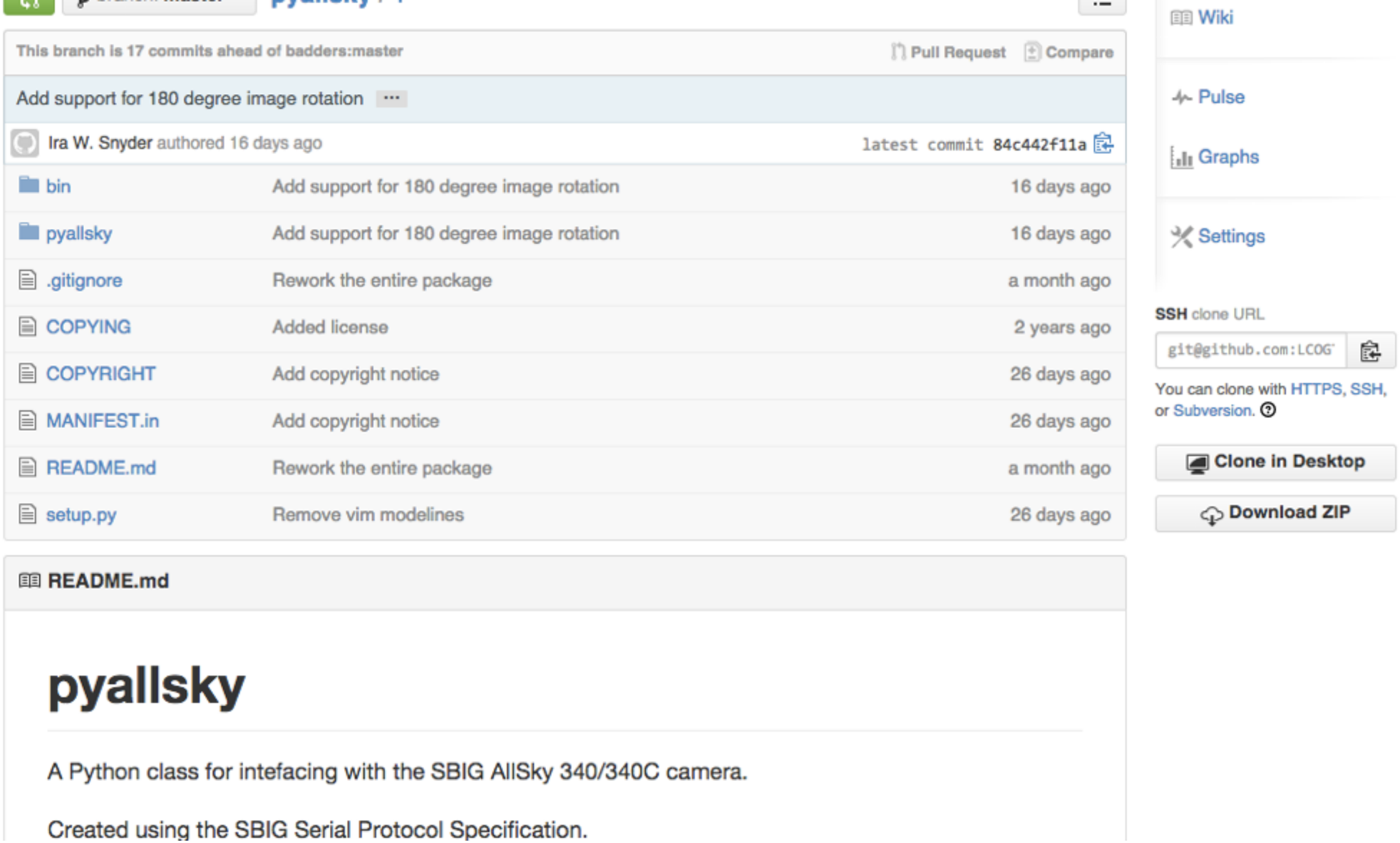


Observation API

- HTTP and HTTPS
- Make requests and check status
- Python interface
- JSON communication

http://docs.framedatabasetest1.apiary.io/

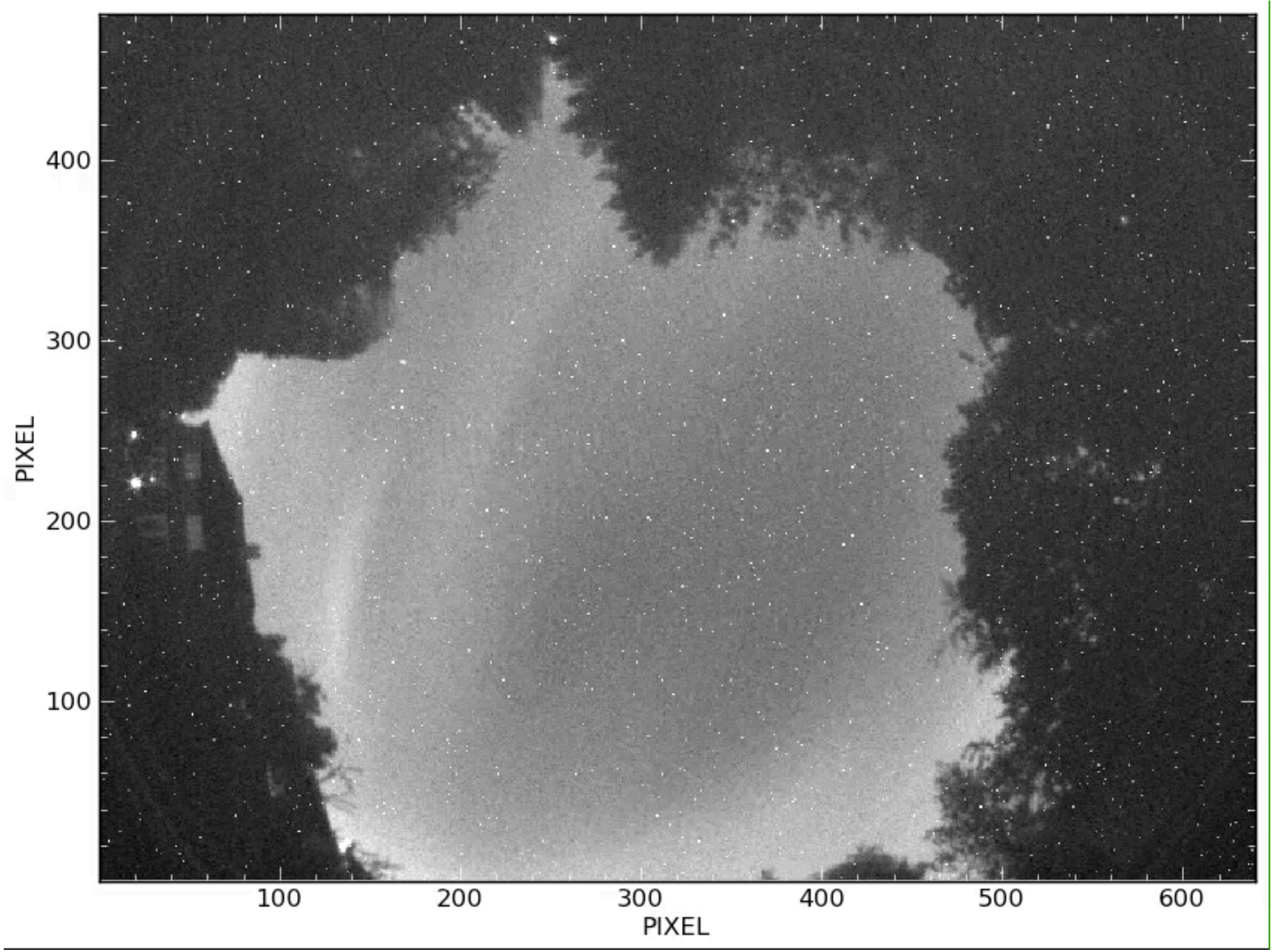

```
    "pitch": null,
    "longofperih": null,
    "meanlong": null,
    "altitude": null,
    "epoch": 2000.0,
    "orbinc": null,
    "parallax": 0.0,
    "meananom": null,
    "scheme": null,
    "diff_roll_rate": null,
    "roll": null,
    "ra": 192.205,
    "epochofperih": null,
    "perihdist": null,
    "diff_pitch_rate": null,
    "longascnode": null,
    "eccentricity": null,
    "argofperih": null,
    "name": "NGC4696",
    "coordinate_system": "ICRS",
    "type": "SIDEREAL",
    "meandist": null,
    "proper_motion_dec": 0.0,
    "hour_angle": null,
    "azimuth": null,
    "dailymot": null,
    "dec": -41.311
},
"windows": [
    {
        "start": "2014-01-22 10:00:00",
        "end": "2014-01-22 21:00:00"
    }
],
"location": {
```



all sky camera

python library

`github.com/LCOGT/pyallsky`



http://lcogt.net/camera/


django

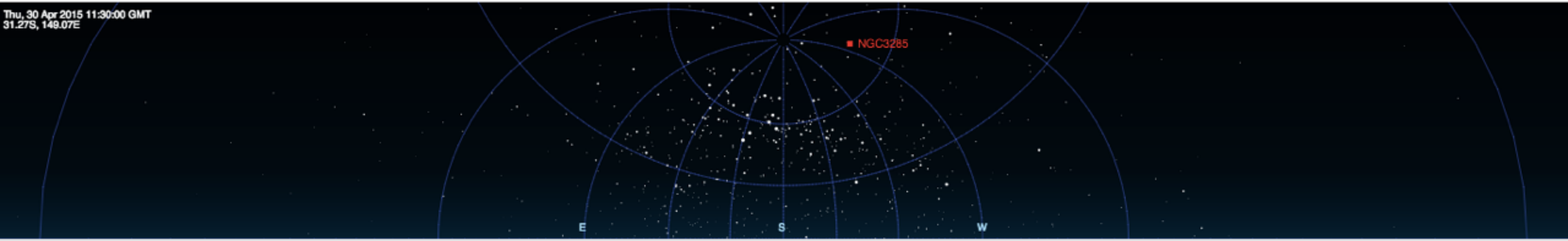
Observing Portal for professionals & education

LCOGT.net **Observatory On Sky**

Home Submitted Management Moderator Feedback Help

Python in Astronomy

Submit



Observation Plan Running total for observations: 6m 2s Add extra target

Target: **NGC3285** (RA: 158.3992625 , Dec: -27.45445) with a **1m0** telescope (**SciCam SBIG**) at **Siding Spring**

Duration: 1m. Exposures: 1. Filter: B. Binning: 2. ✖ Duration: 1m. Exposures: 1. Filter: V. Binning: 2. ✖ Duration: 1m. Exposures: 1. Filter: R. Binning: 2. ✖

2015-04-30 11:30:00 → 2015-04-30 11:45:00

Add more exposures

LCOGT.net TelOps

2014-02-06 12:47 UTC

Chat

Overview | Haleakalā | Sedgwick Reserve | Santa Barbara | McDonald | Cerro Tololo | Sutherland | Siding Spring

Status | Alerts | Graphs

Sutherland

As of **2014-02-06 11:23 UTC**

doma	domb	domc	CPT
1m0a	1m0a	1m0a	Weather
			Power
2014-01-29 16:54	2014-01-27 02:46	2014-01-29 04:35	Network
			Software
			Pipeline
			Servers

Version 1.40

http://telops.lcogt.net

Las Cumbres Observatory Global Telescope Network

Edward G | Logout

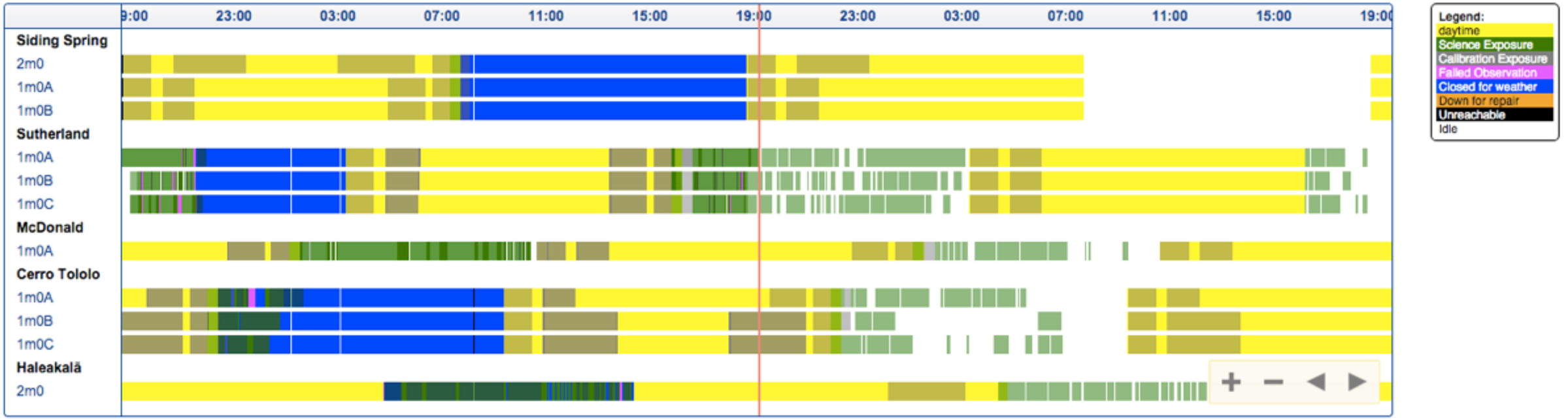
LCOGT.net TelOps

2015-04-20 19:57 UTC

Chat

Overview | ⚠ Haleakalā | ⚠ Sedgwick Reserve | ● Santa Barbara | ● McDonald | ⚠ Cerro Tololo | ● Sutherland | ⚠ Siding Spring

Status | Alerts | Graphs | Scheduler



Version 1.56

Select data product to change

Add data product

Search

Action: --------- Go 0 of 100 selected

Frame	Product type	Reduction step	Md5 hash
coj1m011-kb05-20140206-0197-e00.fits	fits	00	926cd39fe539a3200cb8144fb73f2e6d
coj1m011-kb05-20140206-0196-e00.fits	fits	00	0d3d2093985f374931c9a60fb053ccb4
coj1m003-kb71-20140206-0355-e00.fits	fits	00	95a858e38657fc168ee32f9d822e090f
coj1m003-kb71-20140206-0353-e00.fits	fits	00	5213910e7f3af3c31d52355f7db8c41e
coj1m003-kb71-20140206-0354-e00.fits	fits	00	7ca76f2c3c21f1bc5d4b2f773141c4a3
coj1m003-kb71-20140206-0352-e00.fits	fits	00	a4c928f8074fd30382ce9eea7df858b1
coj1m003-kb71-20140206-0351-e00.fits	fits	00	d12142867a807e3668d7e19e8b013775
coj1m003-kb71-20140206-0350-e00.fits	fits	00	4fbea57df5056857b9a66bcae00dc00b
coj1m011-kb05-20140206-0194-e00.fits	fits	00	998ca4953b6207b85b9413ee1ef123b2
coj1m011-kb05-20140206-0195-e00.fits	fits	00	b24fee46706c0728fa12627beea4a423
coj1m003-kb71-20140206-0349-e00.fits	fits	00	b14f43b4e10a78a9448e9b9faaecf17f
coj1m003-kb71-20140206-0347-e00.fits	fits	00	31bba377ef255f4a37543f610af457a2
coj1m003-kb71-20140206-0348-e00.fits	fits	00	27d03c61727023e9421adcf98816e9f2
coj1m003-kb71-20140206-0346-e00.fits	fits	00	fa2731090976cbd0e88b9cada8bcc0d4
coj1m003-kb71-20140206-0345-e00.fits	fits	00	ed839e94e471005444c2b6554acedb1b
coj1m003-kb71-20140206-0344-e00.fits	fits	00	a71aec80d891a3ffe3adb0ca9209ad5c
coj1m003-kb71-20140206-0343-e00.fits	fits	00	ebe6dbccda29f32134a7c6e3db8cdf6c
coj1m003-kb71-20140206-0342-e00.fits	fits	00	334f9d868abd7ce7754e3f4088685956

Filter

By product type

All

1eAyVE
2hB9cy
30ikL0
5UwaZi
6jT2SW
astromqc
bias
csv
dark
dat
dqc
e1vLni
fits
fits_cat
fits_e
flat
h8qxbY
jpg
M30Xm5
manifest
mltSng
mod
nightlog
ok
png
SDqjyr
sex
sex_fits
tu0iF3

Observations

e.g. NGC 2020 | Search observations

[advanced search]

Welcome. This part of our site aims to ensure that every observation taken by a public user of our network has a permanent web presence. You can see the most recent and popular observations below, search by title, or browse by site, telescope or category.

Most recent observations

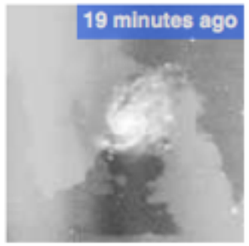
IC2531
By Peter Hill

IC2531
By Peter Hill

IC2531
By Peter Hill

M99
By Peter Hill

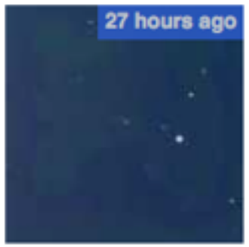
M99
By Peter Hill



M99
By Peter Hill

Currently trending observations

NGC2438
By Sarah Roberts...



c - 2013 A1
By Armagh Obser...

2013 tb80
By Armagh Obser...

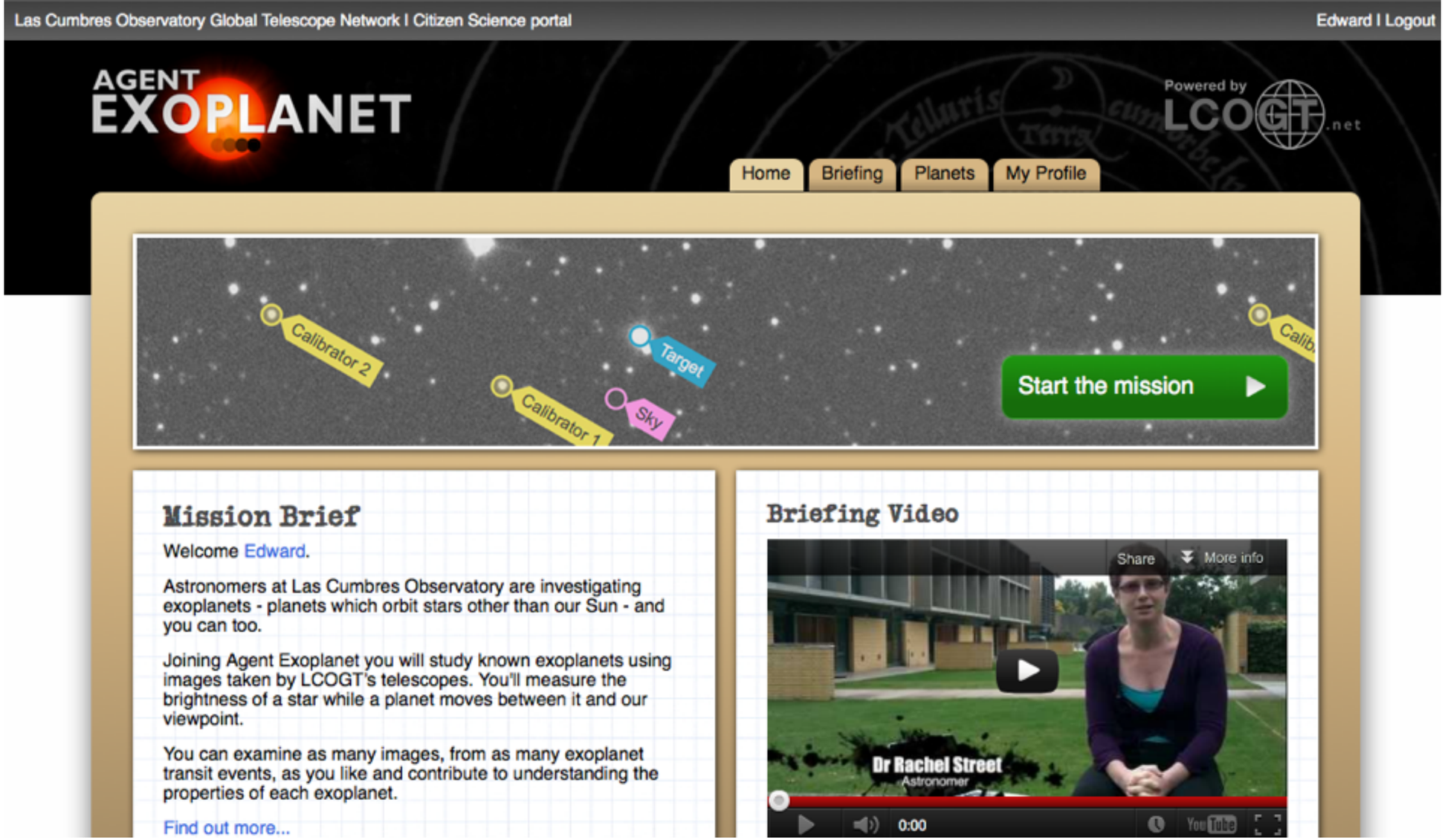
NGC2775
By UoG11 - Hele...

XTE J1728-295
By West Monmou...

M83 (Southern Pi...
By NUCLIO - Nuc...

All-time most popular observations

http://lcogt.net/observations



Agent Exoplanet

http://lcogt.net/agentexoplanet

Django, html, js,css, blood, sweat & tears

Python at LCOGT.net

For Research

- Supernova, NEO, Microlensing observing portals & pipelines
- Image Archive

For Education & Outreach

- Agent Exoplanet
- Open Access Archive

For Instruments

- Testing in the lab
- Creating images from data

For Observing

- Planning tools
- Observation request submission (API & web UI)
- Scheduling

Thank You

python developer
community

Edward Gomez

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http://lcogt.net

http://github/LCOGT