

# Anatomy of an Imaging System

What toys do you need?

PC Software Integration

Session 2



# Anatomy of an Imaging System

3 separate sessions:

1. Description of the hardware and software generally
2. PC software integration and demo
3. Mac/Unix Raspberry Pi software integration and demo

# Getting It All to Work Together



- ASCOM platform for Windows
  - Provides a standardized component object model (COM) interface to most devices
  - Device drivers conform to the standard can be accessed from other software or simple scripts, even from Excel
- There are other platforms such as INDI, but when running Windows ASCOM is the platform of choice



ASCOM

**HOW IT ALL WORKS**



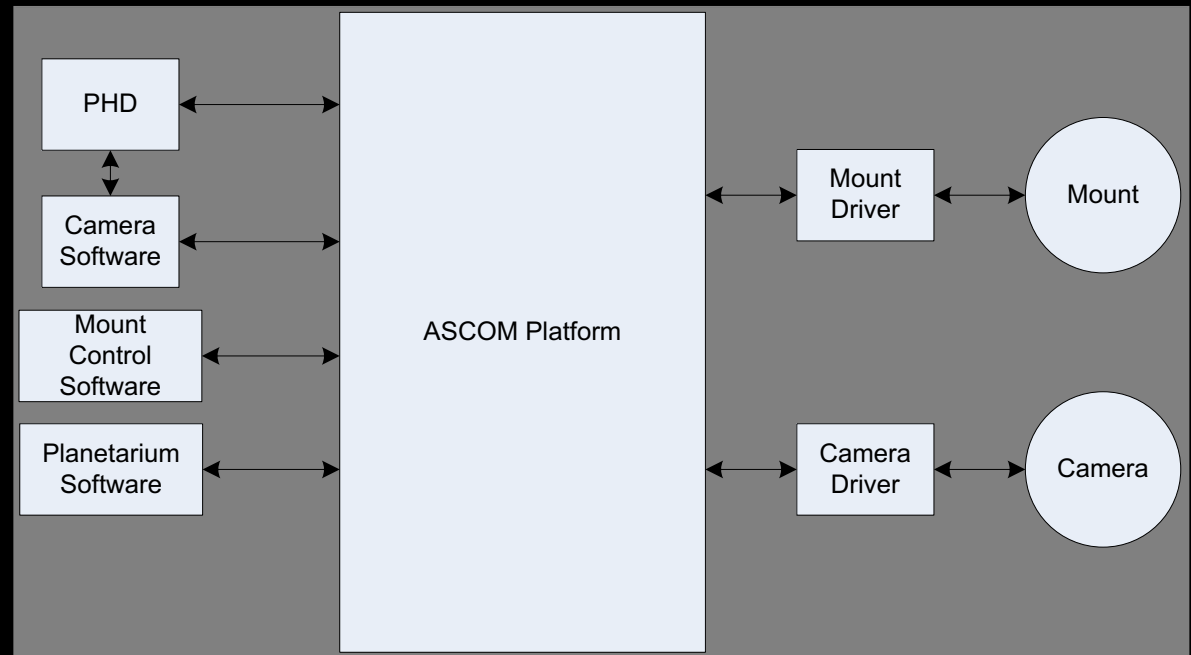
# The ASCOM Platform

- Originally developed by Bob Denny with a telescope control application called ACP
- Convinced Doug George to sign on and add ASCOM support to MaximDL
- Uses the Windows COM interface to provide access to drivers that present a standardized interface to users
- Allows any scripting language or COM enabled application to access devices
- Vendors create drivers for almost anything astro related including dome controllers



# ASCOM Architecture

- Software on the left side communicates through the platform using the ASCOM standard device interface
- Drivers supply standard interface to ASCOM platform
- Not all devices have to go through ASCOM

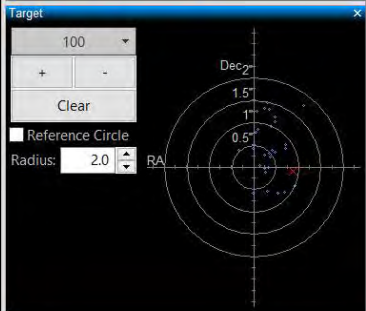
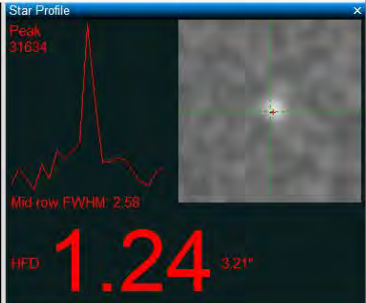
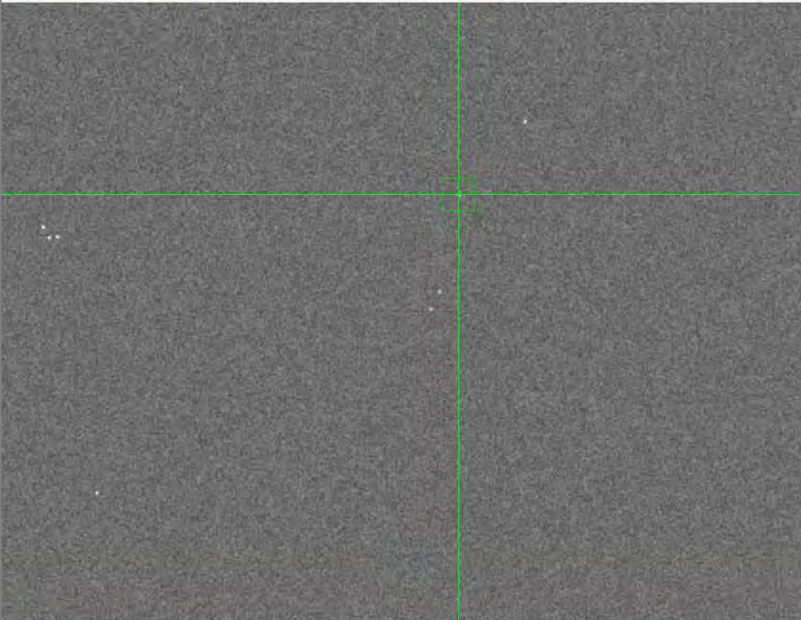


Let's take a look at some of the software that can be integrated through ASCOM



# PHD Guiding

PHD2 Guiding 2.6.6 - test1  
File Guide Tools View Darks Bookmarks Help



**Star Profile**  
Peak 31634  
Mid row FWHM: 2.58  
HFD 1.24 3.21"

**Target**  
100  
+ -  
Clear  
Reference Circle  
Radius: 2.0

**History**

x: 100  
y: +/-4"  
Settings  
Clear

Trendlines  
 Corrections

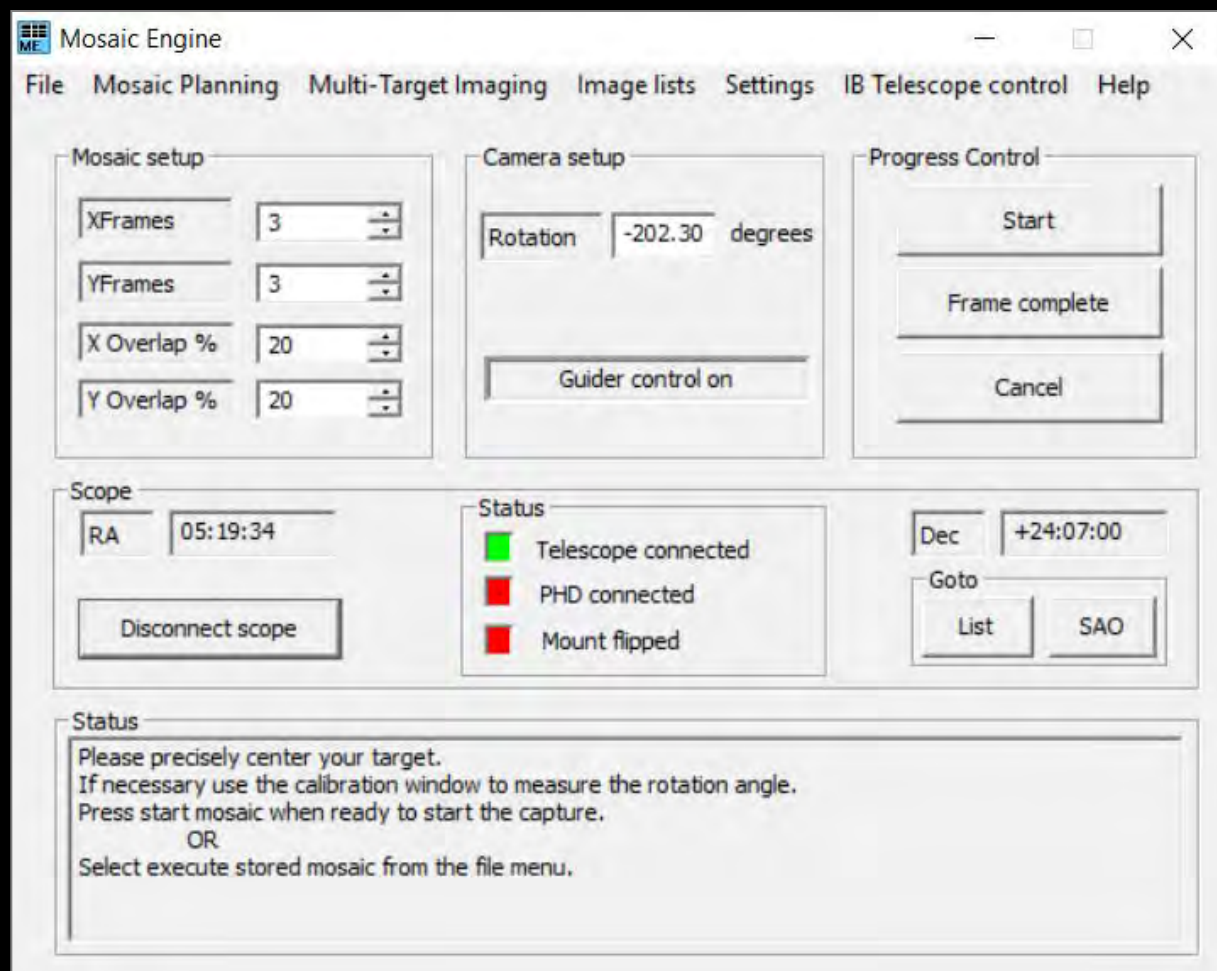
RA Dec  
RMS Error [px]:  
RA 0.12 (0.30")  
Dec 0.24 (0.63")  
Tot 0.27 (0.70")

RA: Agr 70 Hys 10 MnMo 0.21 DEC: Agr 100 MnMo 0.21 Scope: Mx RA 2500 Mx DEC 2500 Auto

1.0 s

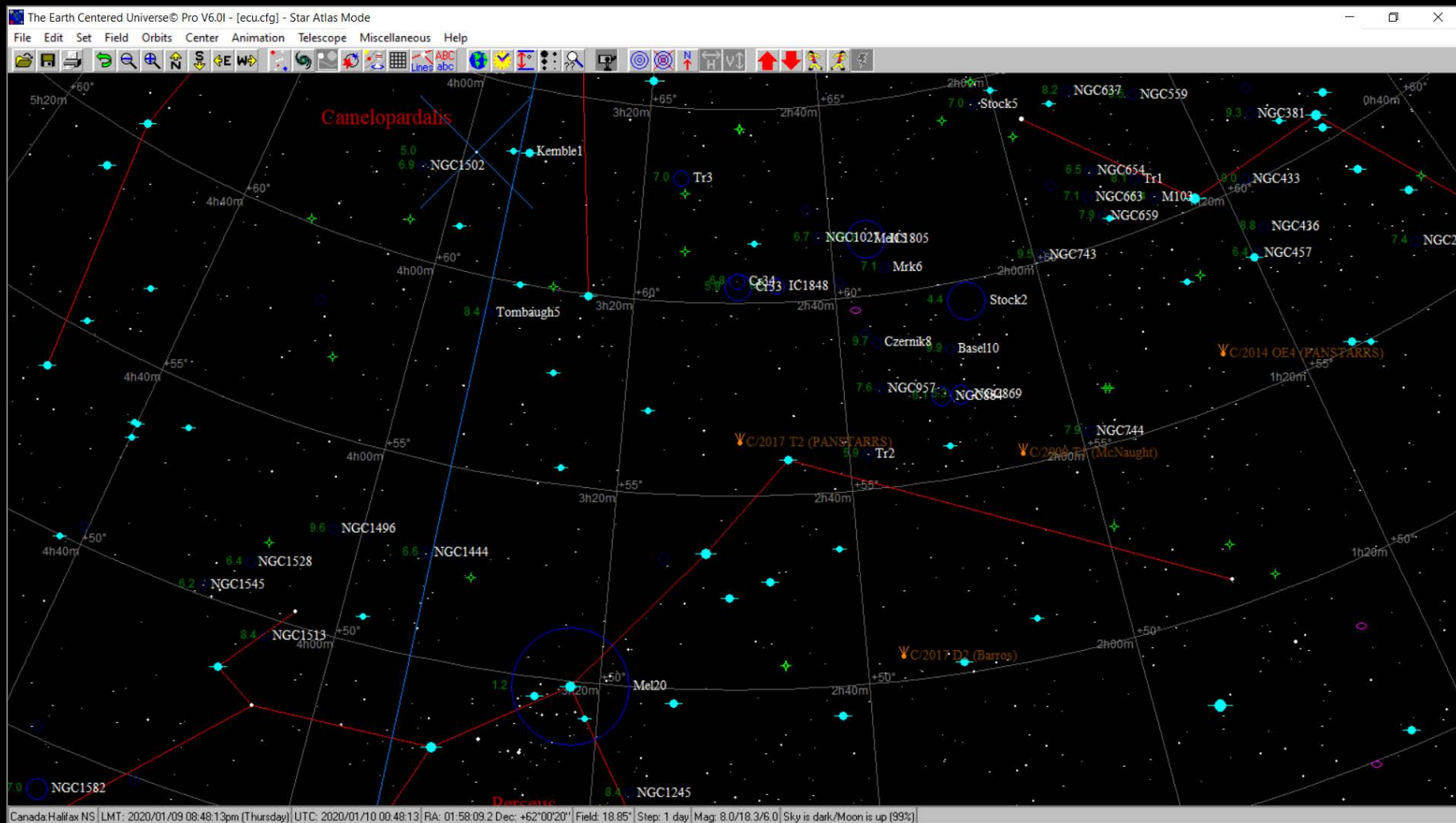
Guiding SNR 18.7 42 ms, 0.3 px Dark Cal

# Telescope Control Software





# Planetarium Software



# Camera Control Software

BackyardEOS 3.0.3 - Classic Edition 18:13:23

**Camera Information Center**

Tv **BULB** ISO **1600**

Dial **M** White **AWB** Mirror **Off** sensor is **+13c**

Quality **RAW** Battery **AC**

**Weather Center**

PHD Daylight

(21:35)  
3 of 30  
**153**

Abort

**Histogram Center**

3 L RGB

Reset



**Image Center** [18h09m50s9332017-11-12.CR2]

Zoom **28%**



**Progress Center**

Estimated finish time 21:35

**3 of 30**

**153 / 360**

You can temporarily suspend your capture plan. The suspend will take effect once the current image capture is complete. You will need to resume the plan to continue.

Suspend

1 @ 18h02m36s    2 @ 18h09m54s

Plan Capture    Loop    Preview    Test image

# Workflow for a typical evening under the stars

- Check ClearDarkSky or Astropheric for suitable conditions
  - Swear
- Setup equipment
- Initial rough polar alignment
- Adjust focus using Bathinov mask
- Align mount using reference and calibration stars
- Accurately polar align using southern star near meridian
  - *Optional - accidentally kick tripod or loose power and start all over again - swear*
- Set up guiding
- Slew to target or plate solve existing image for target
- Configure camera image capture software
- *Optional - watch clouds roll in – swear*
- Look through Mark's scope for the rest of the evening
- Take dark frames typically at the end of the session
- Pack up and go home



BackyardEOS 3.1.0 - Premium Edition (Canon EOS DIGITAL REBEL XS)

Camera Information Center: BULB | f/4.5 | 1600 | ASCOM Focuser | FocusSim Focuser

Disconnect | Imaging | Frame & Focus | Planetary | Drift Align

12:02:28 M33\_Light374in\_Darkfr\_Bias20s\_4nd5m\_CD06000\_ECON120\_000  
 12:02:29 Loading 1 image(s) image(s)  
 12:02:32 M33\_Light374in\_Darkfr\_Bias20s\_4nd5m\_CD06000\_ECON120\_000  
 View file history...

Image Center M33\_Light374in\_Darkfr\_Bias20s\_4nd5m\_CD06000\_ECON120\_000\_2048.jpg

36% x

Histogram Center

Capture Plan Center

Exposure	Shutter	Aperture	Duration	ISO	Filter
1	5	B.L.A.S.	f/4.5	4000	1000
2	15	B.L.A.S.	f/4.5	280	1000
3	20	B.L.A.S.	f/5.0	900	800
4	0				
5	0				

Load | Save | Start | Reset

Start Capture | Loop | Preview

# ASCOM Demo

Mosaic Engine

File | Mosaic Planning | Multi-Target Imaging | Image lists | Settings | IB Telescope control | Help

Mosaic setup

XFrames: 3  
 YFrames: 3  
 X Overlap %: 20  
 Y Overlap %: 20

Camera setup

Rotation: -35.0 degrees  
 Guider control off

Progress Control

Start  
 Frame complete  
 Cancel

Scope

RA: 16:55:39  
 Dec: +89:48:47  
 Goto: List | SAO

Status

Telescope connected  
 PHD connected  
 Mount flipped

Status

Please precisely center your target.  
 If necessary use the calibration window to measure the rotation angle.  
 Press start mosaic when ready to start the capture.  
 OR  
 Select execute stored mosaic from the file menu.

PHD Guiding 2.66 - test1

Live Guide Tools View Data Settings Help

1.24 arcsec

RA: 16:55:39 | Dec: +89:48:47 | Scope: 1000mm | Filter: Clear | Filter Wheel: 1 | Filter: 1

Guiding