



天文选址站的远程控制

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选址站点的远程控制包括

- 选址望远镜等设备的远程控制
- 选址观测数据的自动远程传输和归档
- 气象数据和云量的准实时发布
- 监控图像的远程监控和网络发布

一，选址望远镜控制软件接口

■ Serial Command Protocol



■ ASCOM



Serial Command Protocol

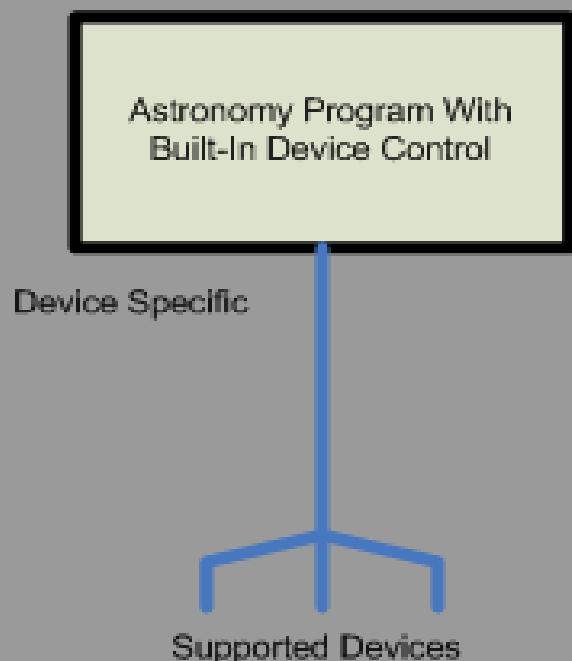
- LX200 for Meada



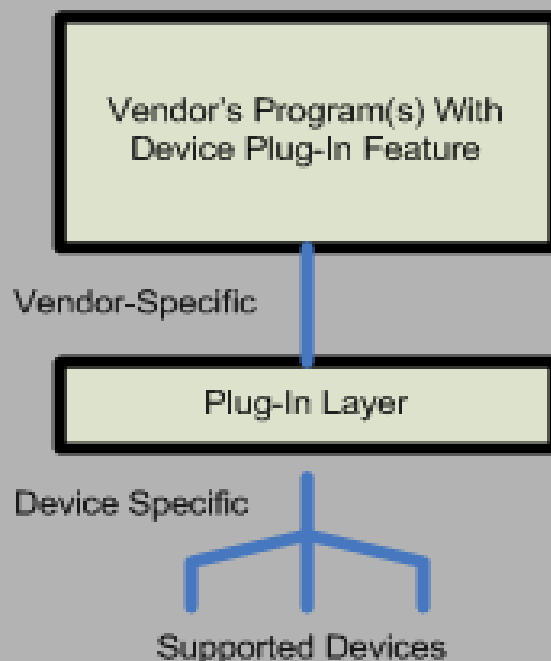
- GTOCP3 Servo Control Boxes for AP



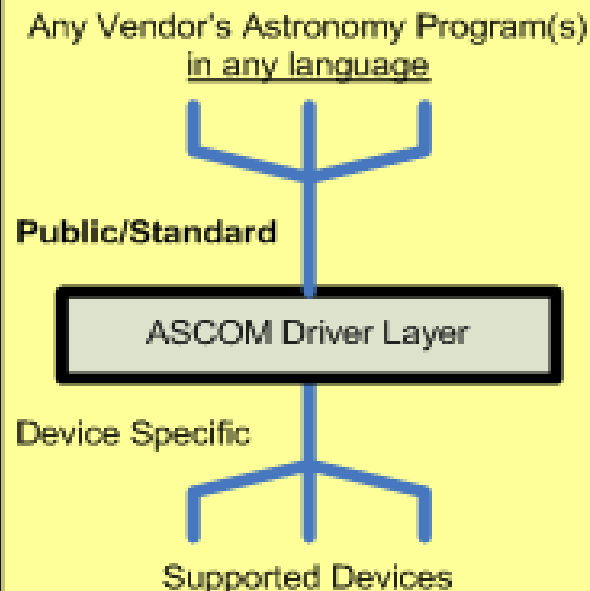
Monolithic



Extensible



Open (ASCOM)



- ✓ Each program must have its own code for device control
- ✓ Vendors must write all device control code
- ✓ New devices require new releases of programs
- ✓ Bugs in device control require new releases of programs

- ✓ Several of vendor's programs can share device control code
- ✓ Anyone can write device control plug-ins
- ✓ New devices require only new plug-ins
- ✓ Bugs in device control require only new plug-ins

- ✓ Vendor-independent: any program can use a driver
- ✓ Anyone can write and support drivers
- ✓ New devices require only drivers
- ✓ Bugs in device control require only new drivers

ASCOM



- The ASCOM Initiative is a loosely-knit group of developers and astronomical instrument makers that work together to bring vendor-independent and language-independent plug-and play compatibility between astronomy software and astronomical instruments. ASCOM stands for the Astronomy Common Object Model.

Compatible Languages



- C++
- Delphi Pascal
- Visual Basic 6
- FORTRAN
- C#.NET
- VisualBasic.NET
- Java (the real thing)
- COBOL
- RemObjects PascalScript
- Perl
- Python
- Tcl/Tk
- PL/1
- ReXX
- JavaScript/JScript
- VBScript
- Microsoft Office (all products!)
- Squeak Smalltalk
- Visual Smalltalk
- REALBasic
- MATLAB
- LABView

Drivers Include



- Telescope/Mount
- Camera
- Dome & Roof
- Filter Wheels
- Focuser
- Rotator



Telescope/Mount



- ACL Telescope Controllers
- Astro-Physics GTO
- Celestron Unified
- EQMOD Project
- Gemini Telescope
- Generic LX-200
- Intelliscope
- LittleFoot Controller Project
- Meade LX200 Classic and Autostar #494, #495, and #497
- Meade LX200GPS and LX200R
- PC-TCS ServoCAT
- Takahashi Temma
- TheSky Controlled Telescope (Paramount, etc.,) for TheSky X and TheSky 5/6
- Vixen SkySensor 2000
- Vixen Sphinx

Camera Drivers



■ Finger Lakes Instrumentation The logo for Finger Lakes Instrumentation (FLI) consists of the letters "FLI" in a bold, red, sans-serif font. To the right of the letters is a circular icon containing a stylized star or cross shape. Below the "FLI" text, the words "Finger Lakes Instrumentation" are written in a smaller, black, sans-serif font.

■ Orion StarShoot Family The Orion logo features a stylized black silhouette of a telescope or scope. To the right of the silhouette, the word "ORION" is written in a bold, black, sans-serif font. Below "ORION", the words "TELESCOPES & BINOCULARS" are written in a smaller, black, sans-serif font. To the right of the main text is a circular seal with the words "Since 1975" inside.

■ Quantum Scientific



A



ACP Observatory Control Software

ACP Telescope Camera Dome Weather Help

LST: 19:18:11	COR CA SLEW EAST
RA: 20:00:11.2	TRACK GUIDE EXPOSE
Dec: +30°00'28"	FOCUS DOME WEB FTP
Az: 110.11	☐ Display Hour Angle
Alt: +80.32	☒ Sidereal Tracking
UTC: 15:03:30 17-Mar-05	☐ Use Night Colors
● Local ● UTC ● Julian	

Target

RA: 20:00:11
Dec: +30:00:28

Sync Scope

Web Access

Activity:

User:

Status: Local use

Owner: Robert B. Denny

Script

C:\Program Files\ACP2\Scripts\AcquireImag Browse...

VBScript Click Browse to select the script to run.
Most often this will be AcquireImages.vbs.

Console

Console output:

```
Solved! 77 stars matched.  
Average residual is 0.13 arcsec.  
Pointing error is 0.001 arcmin @ PA -164.78  
Imager roll angle is 10.0 degrees  
True focal length is 126.0 cm.  
[sync] pointing model updated  
Within max error tolerance, no re-slew needed.  
Camera is aimed at the target.  
Shutdown command seen.  
(long exp, no orbital tracking, trying to autoguide)
```

Abort alert() main()

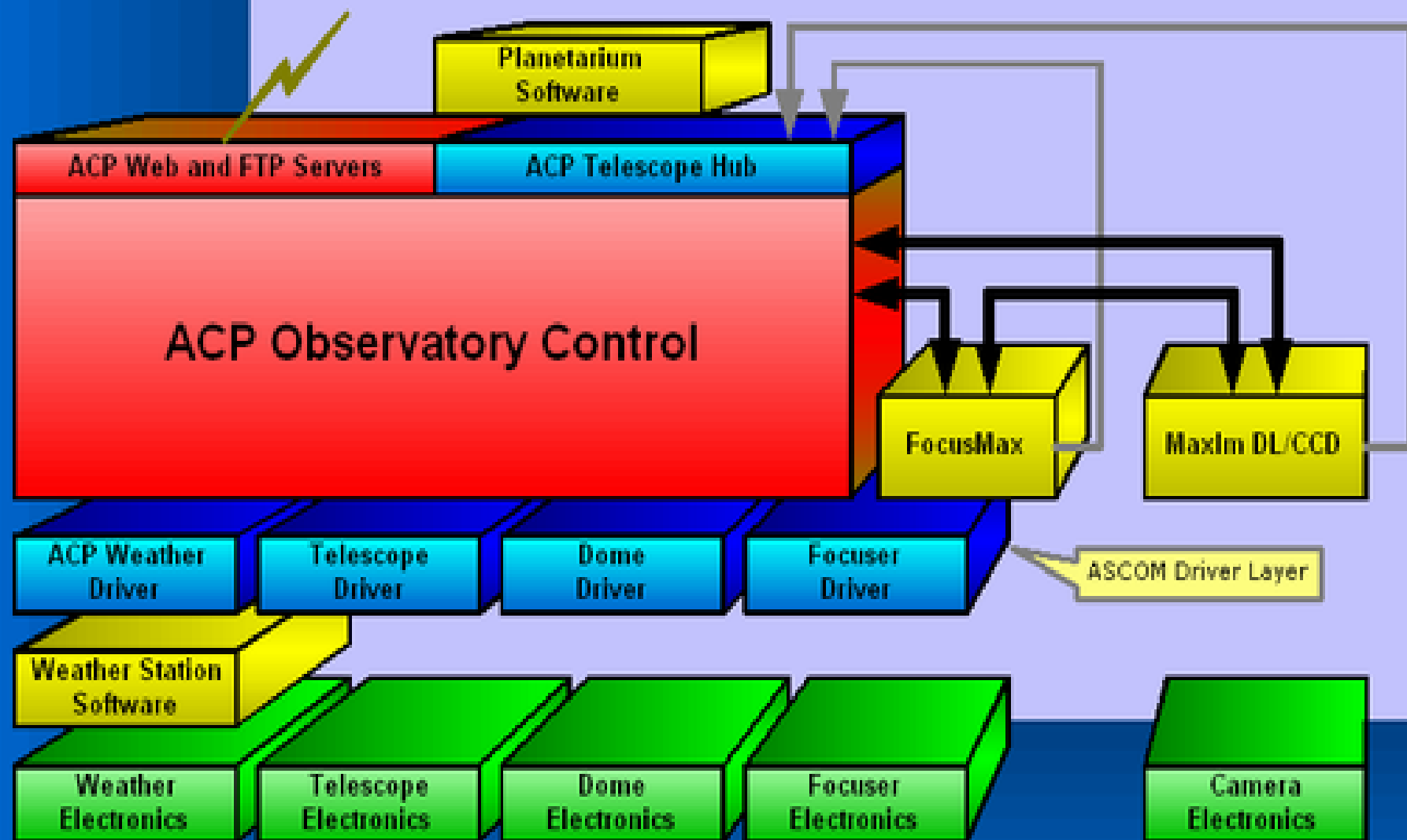
Slew or Sync (catalog)

Nudge Telescope

Use Web Browser

Dome Control

ACP Observatory Control Architecture



小望远镜的控制物理结构



网络结构1



网络结构2





要考虑的问题

■ 观测的安全性

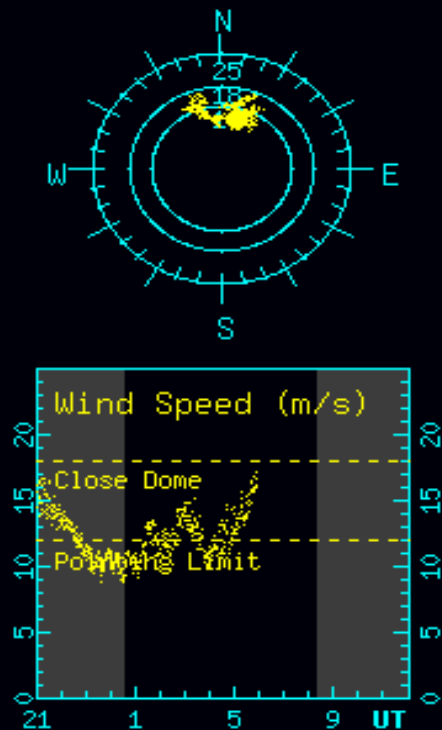
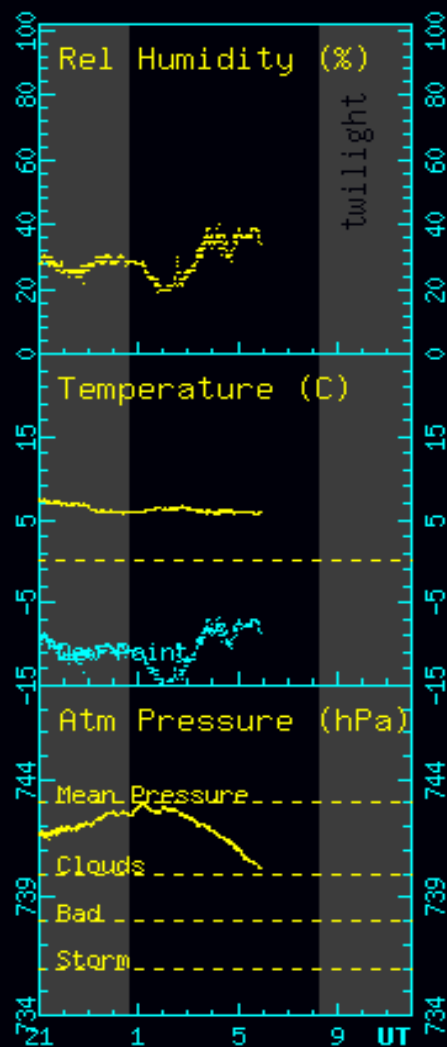
- 网络安全，VPN
- 设备安全，网络延时、防雷、远程启动和复位、断电保护。。。

二，选址观测数据的自动远程传输和归档

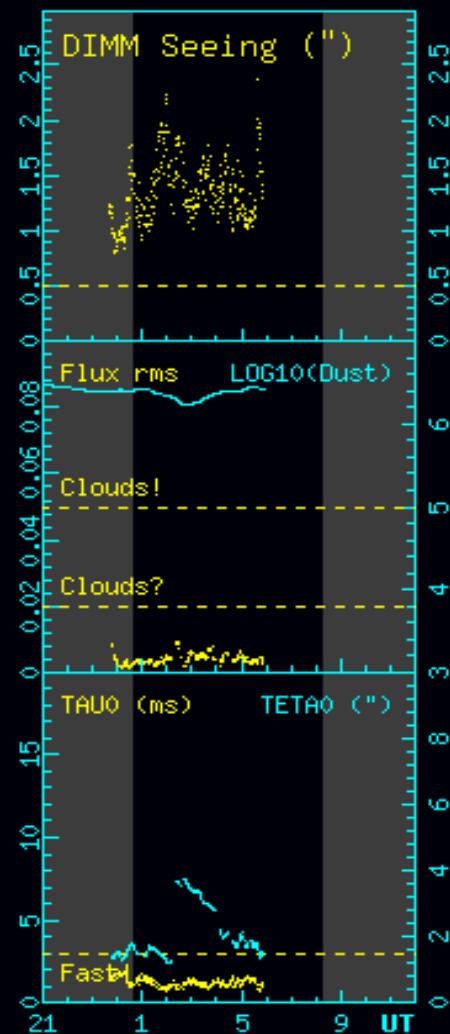
- 数据内容：SBIG视宁度、DIMM视宁度、CT2微温近地面湍流、MASS分层湍流、Scidar湍流廓线，以及云量图像和其他观测数据。
- 归档地点：狮泉河镇服务器和北京服务器
- 现在采用的自动文件FTP方式定期传送到北京。

三，气象数据和云量的准实时发布

- **发布内容：**气象站得到的数据，包括风速、风向、温度、气压和湿度。云量包括白天、晚上和红外云量
- **数据内容：**气象数据均为单点数据，采样频率为每分钟1个点，24小时连续采样。白天云量、夜间云量、红外云量。云量图片在互联网发布时可以进一步压缩。
- **发布方式：**网页发布，网页设计类似ESO界面，同时可以显示云量情况。



Ambient conditions for
Paranal
on the night of
Thu, November 18, 2010
Night begin: 00:33 UT
end: 08:21 UT

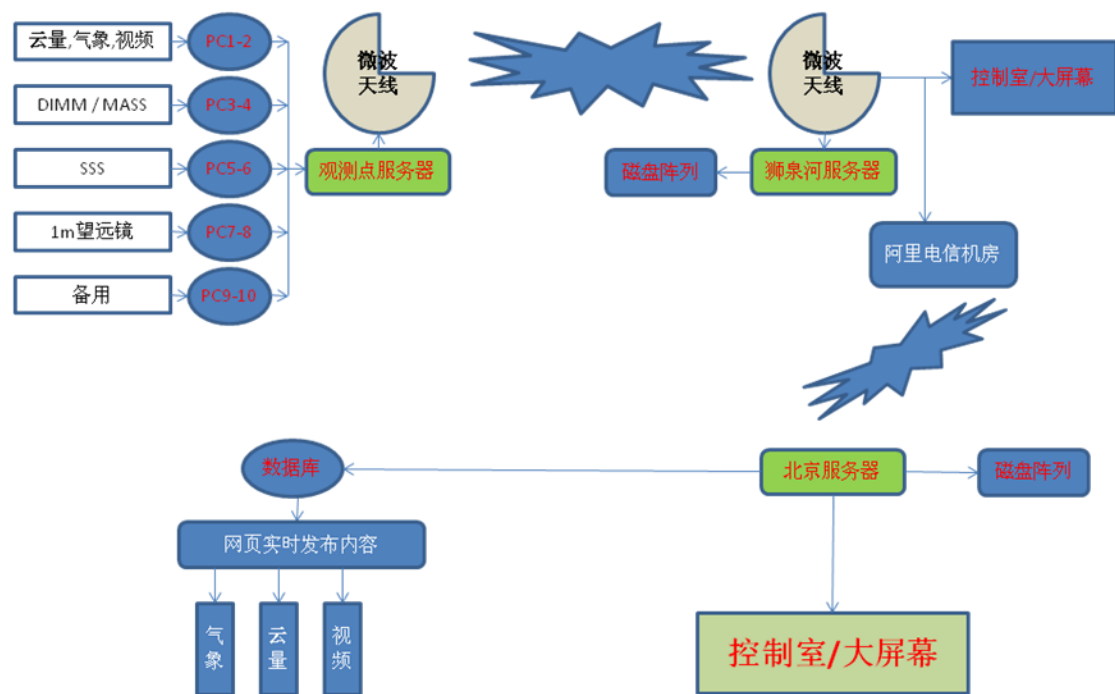


四，视频监控图像的远程监控和网络发布

- 多路视频图像要进行远程监控，包括在狮泉河站和北京。至少有8路以上的视屏图像要进行显示，但并不要求完全实时或者同时显示。监控设备的原始图像存储在观测站点，比如硬盘录像机。
- 发布内容：狮泉河站网页的视频图像。
- 数据内容：视频图像
- 发布方式：网页发布
- 网站地点：北京
- 更新频率：5分钟，同时发布3-5个监控图像

五，狮泉河镇和北京观察室建设要求

- 山上观测站点尽量做到无人值守，观测在狮泉河镇观测室进行。可以认为未来从狮泉河镇到观测点的网络带宽是可以保证的，比如光纤连接。所有望远镜要进行远程控制，观测资料直接存储到狮泉河镇的数据存储设备上。气象云量等资料也要在这里进行归档。
- 北京观察室的主要目的是在北京观察野外的情况以及核心数据的备份、发布等。





野外自动模式

- 条件：电（太阳能）和网（手机。。。）
- 全自动
- 在线监测，故障通知，远程启动复位



初步试验

- 利用**ACP**实现了网间的望远镜控制