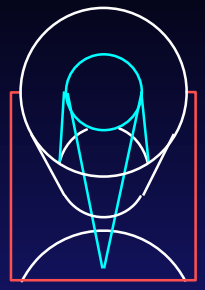
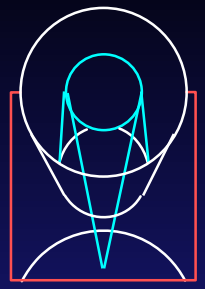


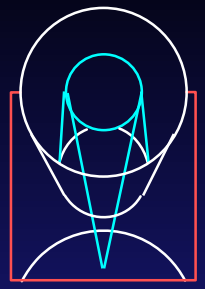
Astronomer's Proposals Tool (APT)
Peer Review

Tony Krueger – May 22, 2000

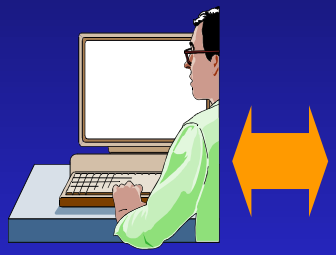


Project Background

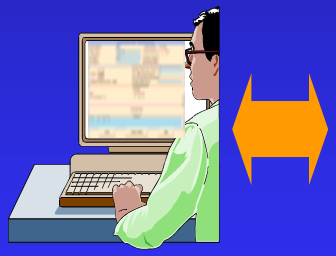
The Application



Observer

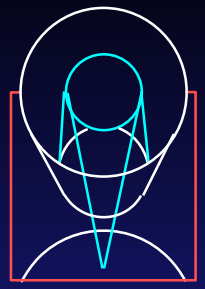


Tools Today



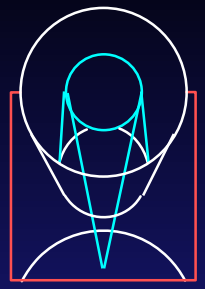
Tools Tomorrow

Phase 0 Support	Phase 1 Support	Phase 2 Support	Black Box	Archival Support
What Can I Do	Propose Idea	Accepted Proposal		Archival Research
None	Latex Forms Exp Time	RPS2		Starview2
APT ?	APT	APT		APT & Starview2



APT Goals

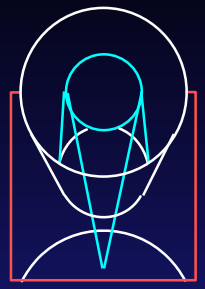
- To develop STScI's Next Generation Proposal Preparation/Development Tools
- Provide PIs with an Integrated Observatory Tool
  - Provide Phase 1 Support
  - Provide Phase 2 Support
  - Provide Archival Research Support
- Replace Existing Support Tools
  - Phase 1 tools (latex forms, exp time calc)
  - Phase 2 tool (RPS2)
- Provide PIs with Usable tools as soon as possible



Scientist Expert Assistant (APT Foundation)

- Goddard Research Effort with HST Science Input
- SEA Goals
  - To apply expert system technology to Proposal Development
  - To apply visualization techniques to Proposal Development
- SEA Results
  - Expert System Technology use not fruitful
  - Produced a well received software prototype
  - Some tools useable today
- 3-4 developers for about 2 yrs

Proposal Editing (RPS2)



PED Fixed Target Editor – Editing Target 400

Target Number:	400	Primary Category:	EXT-STAR
Target Name:	R136A2-OFF	Primary Description:	"WOLF RAYET"
Alt Name 1:	MH511	Secondary Category:	
Alt Name 2:		Secondary Description:	

Position: **R=0.065", PA=65D, FROM 4**

Equinox of Coordinate System: **J2000**

RA Proper Motion (secs of time/yr): 0.0

DEC Proper Motion (arcsec/yr): 0.0

Epoch of Position (only if proper motion):

Annual Parallax (arcsec): 0.0

Radial Velocity/Redshift:

Flux Data

Type	Specification
Broad_Band_Magnitude	V = 13.38+/-0

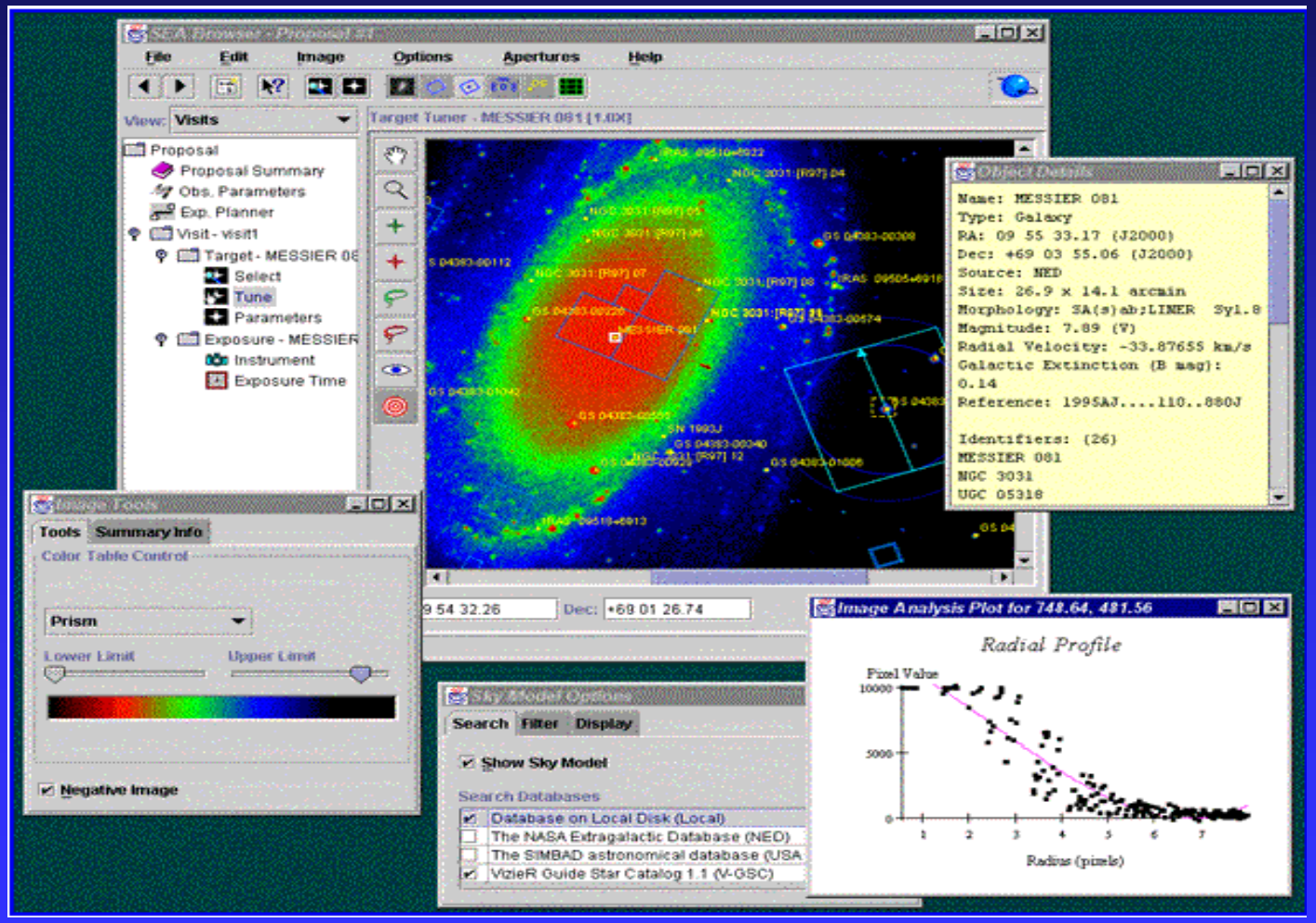
New Flux Value

Comments

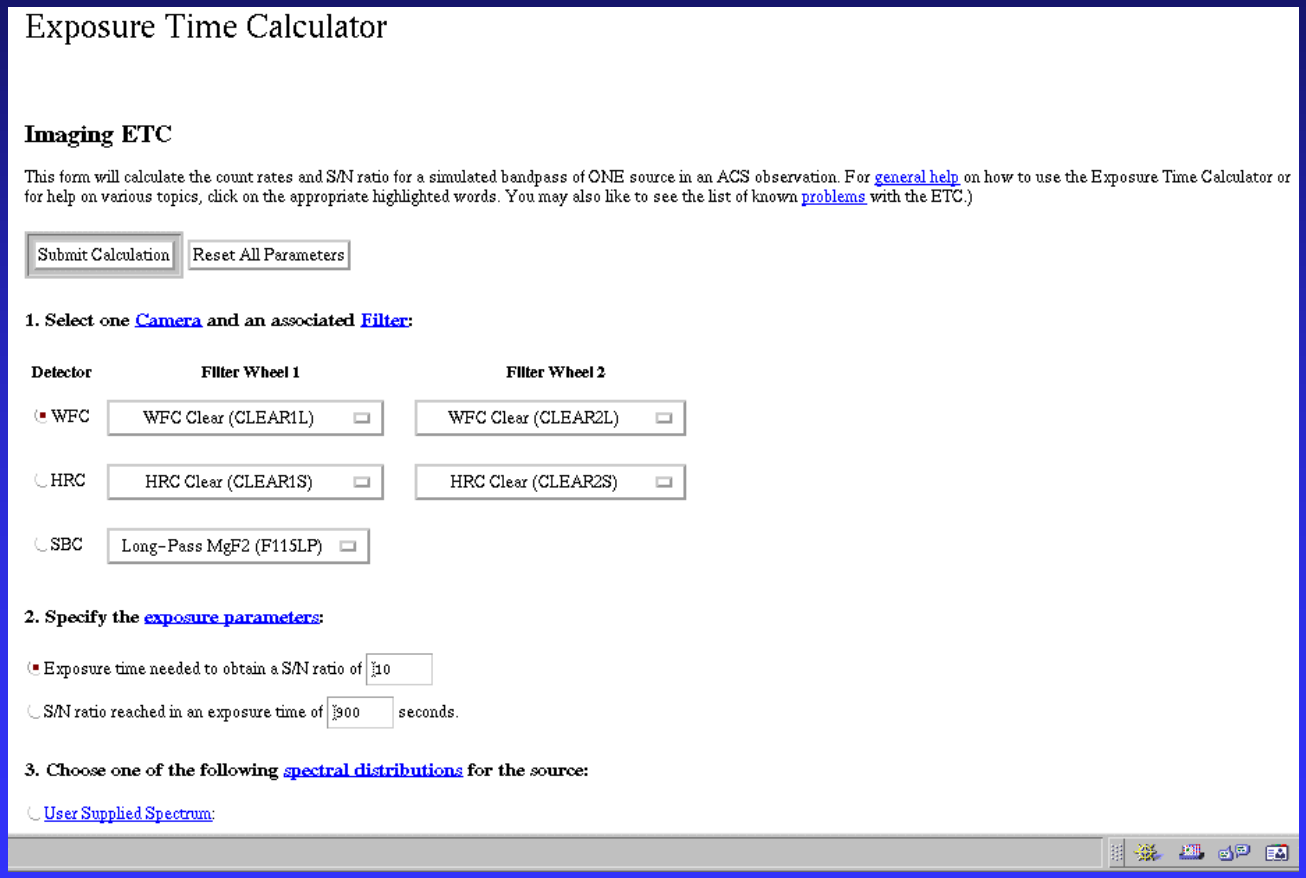
OFFSET TO NE TO EXCLUDE A1

Done | Check Target | Help

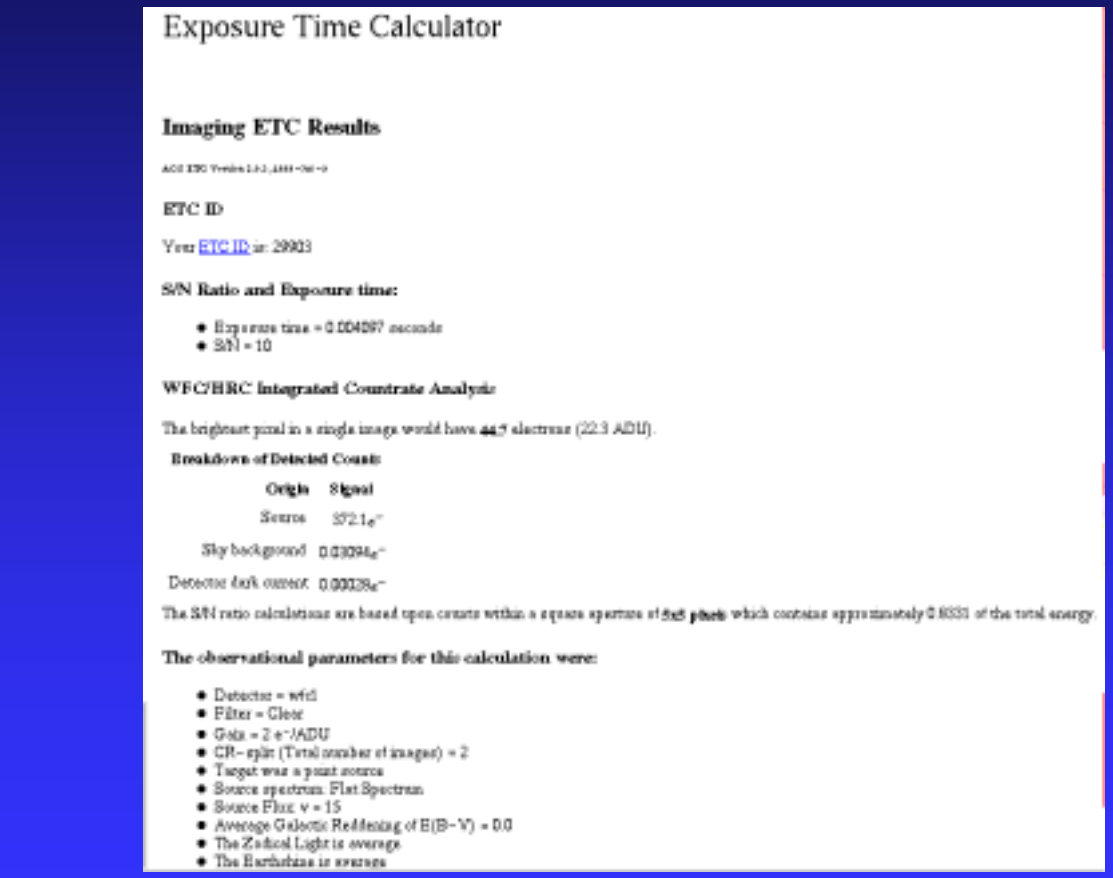
Visual Target Tuner (SEA)



ACS ETC Input(Web Based)



ACS ETC Output (Web Based)



Exposure Time Calculator

Imaging ETC Results

ACS ETC Version 2.3-2, [illegible]

ETC ID

Your ETC ID is: 29903

S/N Ratio and Exposure time:

- Exposure time = 0.004097 seconds
- S/N = 10

WFC/HRC Integrated Countrate Analysis

The brightest pixel in a single image would have 44.7 electrons (22.3 ADU).

Breakdown of Detected Counts

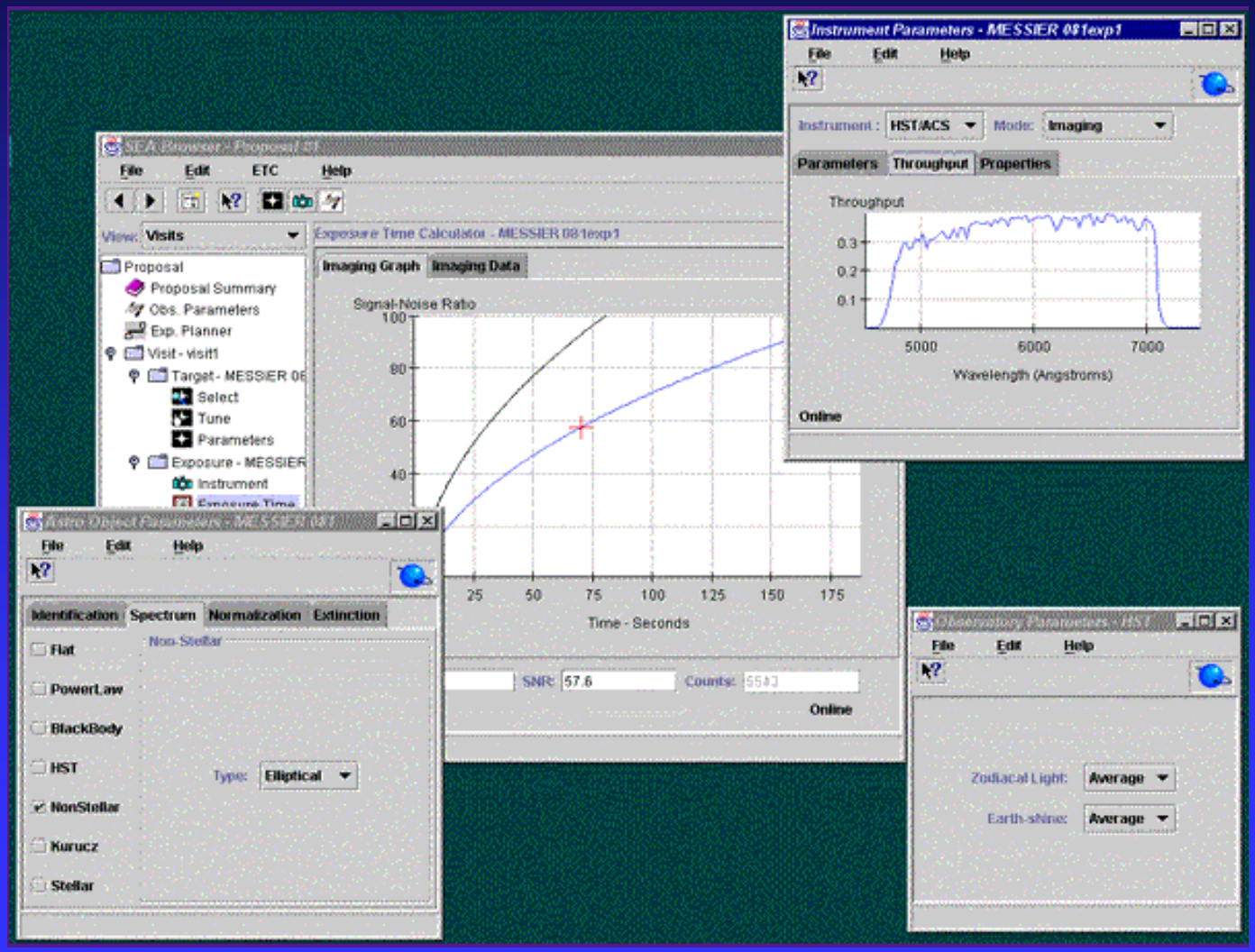
Origin	Signal
Source	372.1 e^-
Sky background	0.03094 e^-
Detector dark current	0.00028 e^-

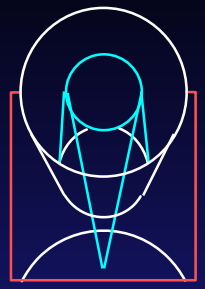
The S/N ratio calculations are based upon counts within a square aperture of 5x5 pixels which contains approximately 0.8331 of the total energy.

The observational parameters for this calculation were:

- Detector = wfc1
- Filter = Clear
- Gain = 2 e^-/ADU
- CR-split (Total number of images) = 2
- Target was a point source
- Source spectrum: Flat Spectrum
- Source Flux: v = 15
- Average Galactic Reddening of E(B-V) = 0.0
- The Zodical Light is average
- The Earthshine is average

Exposure Time Calculator (SEA)





Development Approach

APT – A Collaborative Effort

STScI

Stefi Baum & Rick White

Engineering & Software Services Division

Tony Krueger

Project Manager

Software Development

Tony Krueger – Lead

Developers

Testers

Technical Writer

Science Support

Steve Lubow – Lead

Megan Donahue

Ron Downes

Chris O'Dea

Max Mutchler

Ray Lucas

Goddard

Julie Breed

Advanced Architectures & Automation Branch

Jeremy Jones

Project Manager

Software Development

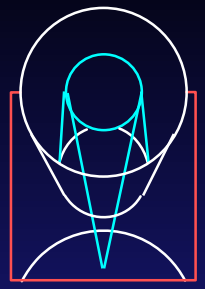
Jeremy Jones – Lead

Developers

Testers

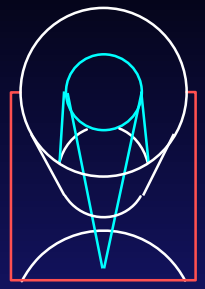
Science Support

Anuradha Koratkar



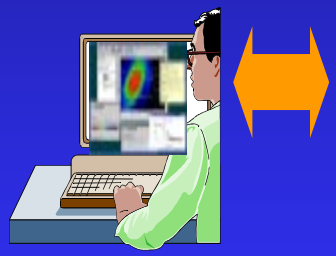
Goddard/STScI Collaboration

- Technical Collaboration
  - STScI and Goddard sharing software enhancements
  - Joint technical meetings and email lists
  - Goddard providing technical assistance & training
- Science Collaboration
  - Numerous meetings on nature of ongoing work of the SEA & APT
  - Goddard's priorities on research in image simulation & natural language
  - STScI priorities on building upon the SEA prototype for HST operational use
- Using Goddard SEA evaluation to help prioritize our work

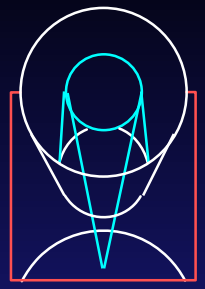


APT Major Capabilities

Observer

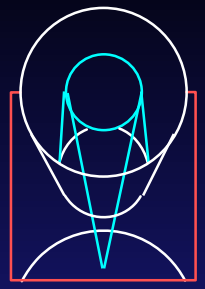


Phase 1 Support	Phase 2 Support	Archival Support
Exposure Time Calculators Calculates Exposure Times	Orbit Planner Layout Exposures in Orbits	Archival Research Science from HST Archive
	Visit Planner Schedulability Analysis	
	Visual Target Tuner Target Selection	
Top Level GUI & Architecture Glues Tools Together		



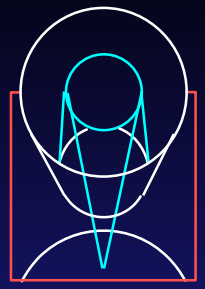
Development Strategy

- Phased development approach
  - Make capabilities available as soon as possible
  - Currently defining requirements/capabilities for all phases
  - Six external releases 6 months apart
  - Six week internal releases when practical
- Tool Teams
  - Take Tools from Idea (innovation) to operations (fielding)
  - Consists of Developer(s), Testing Support, & Scientists
  - Similar to Goddard SEA development model
- Teams coordinate efforts through meetings & documentation
- Schedules budget for Innovation



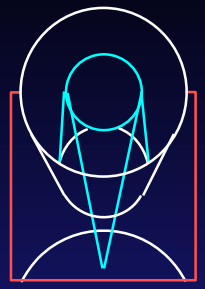
Development Strategy

- Software Development
  - Requirement Reviews (within team and outside of team)
  - Design Reviews (within team mostly)
  - Code Reviews for compliance with coding standards (within team)
  - Keep Data Model separate from GUI and Control
  - Design is Object Oriented
- GUI Software Development
  - Iterate and Prototype approach with scientist before checking in software
  - Prototype concepts and ideas versus large requirements definition
- Documentation available on team web page

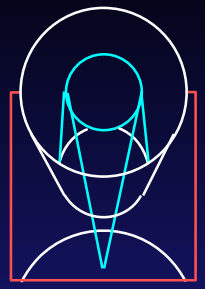


Design/Development Tools

- UML Tool is Rational Rose
- IDE Tool is Code Guide
- Configuration Management Tool is CVS
- Development Language is Java
- Java Help used for on-line User documentation
- Install Anywhere used for application installation
- Documentation in MS word or Framemaker
  - Needs to be web displayable
- User Support using STScI Help Desk Software
- Software Problem Reports using STScI OPR system

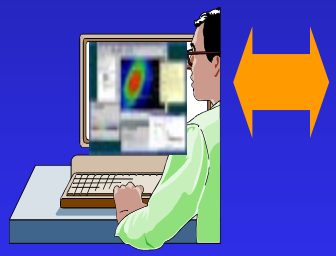


System Architecture



APT Major Capabilities

Observer



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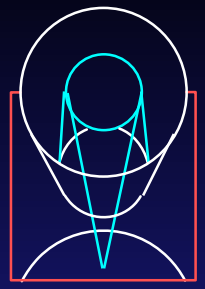
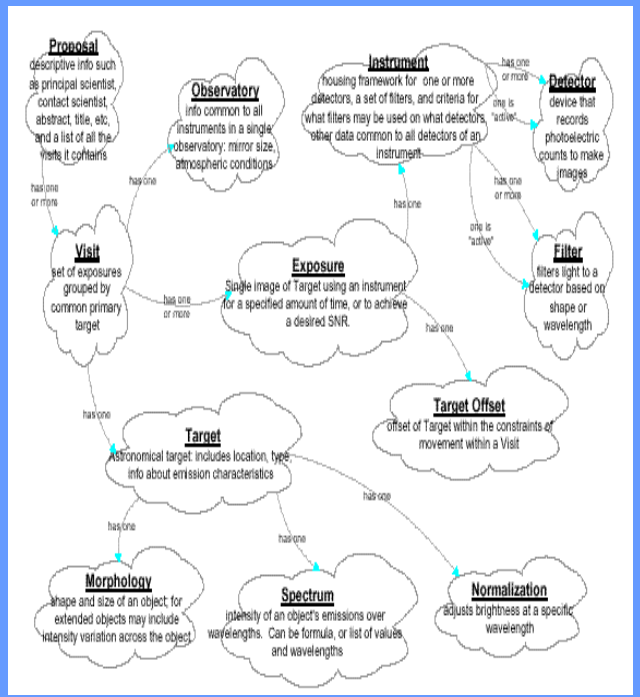
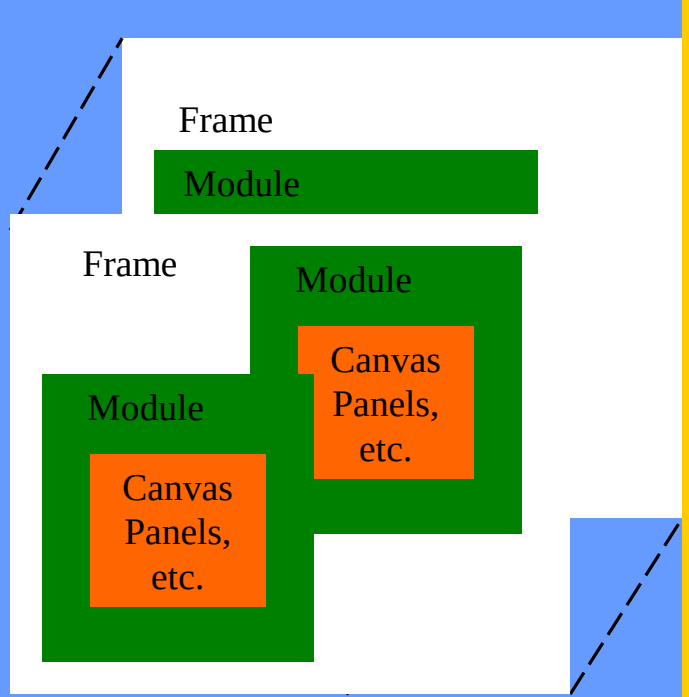


Architecture

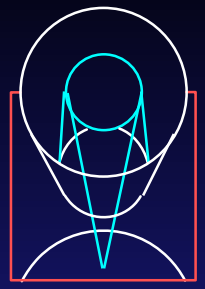
Data Model



GUI

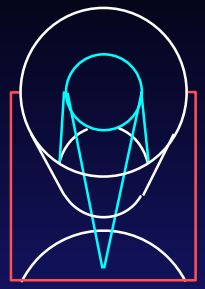


Events & Listeners



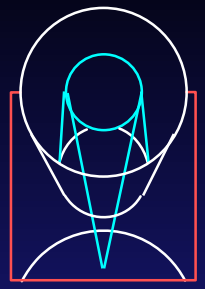
Architecture Design

- Information is taken from http://ngst.gsfc.nasa.gov/public/unconfigured/doc_64_1/SEADesignDoc.pdf
- SEA uses the MVC design pattern
- Controller/Viewer are combined in the GUI "Modules"
- Data model is a collection of ScienceObjects
- Communication of changes to the data model are handled by Events & Listeners



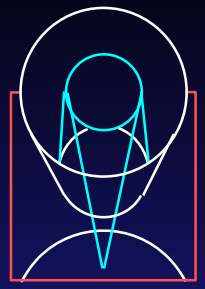
Controller/Viewer Elements

- Frames
- Modules
- Canvases
- Other standard extensions to the Java Swing Toolkit

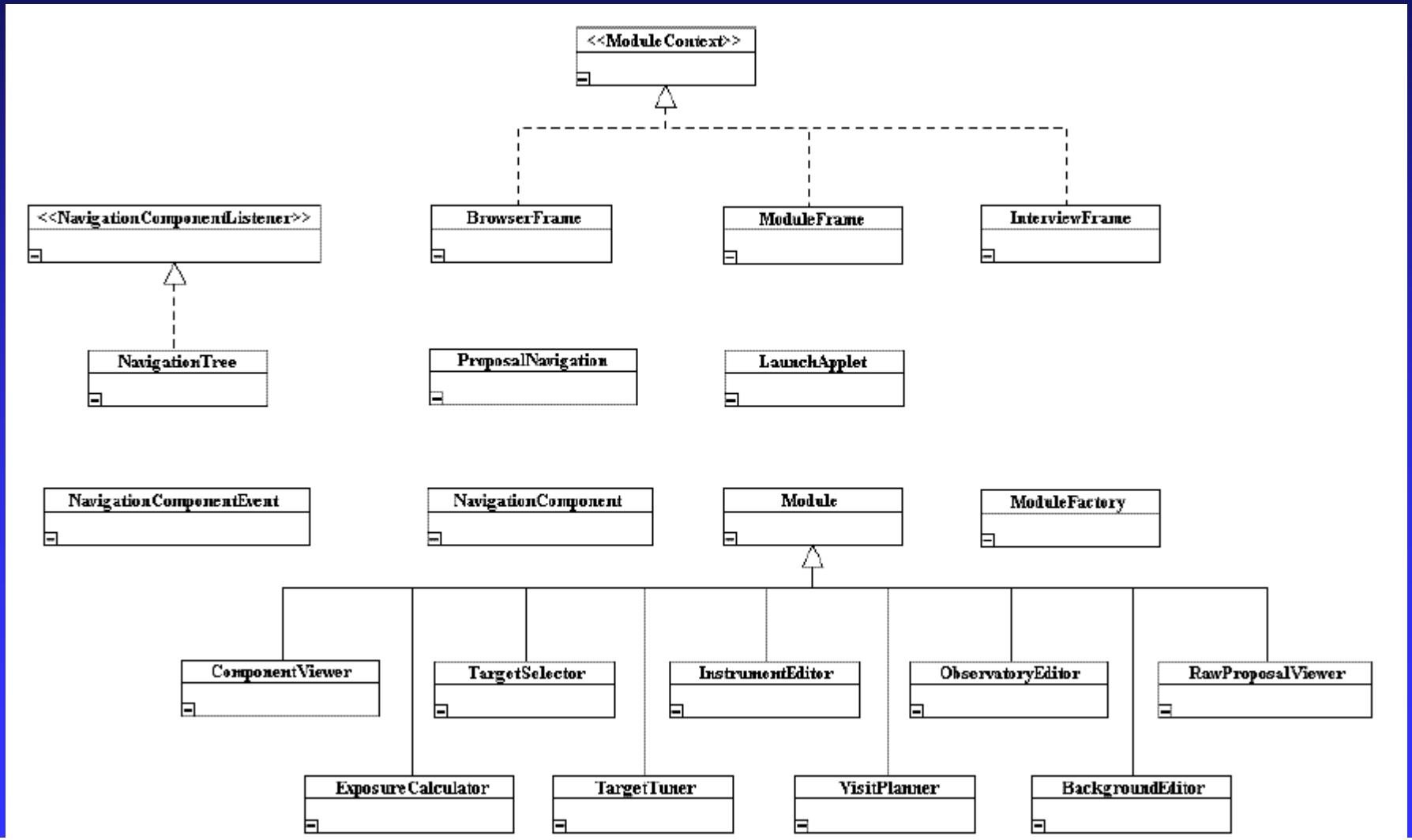


Modules

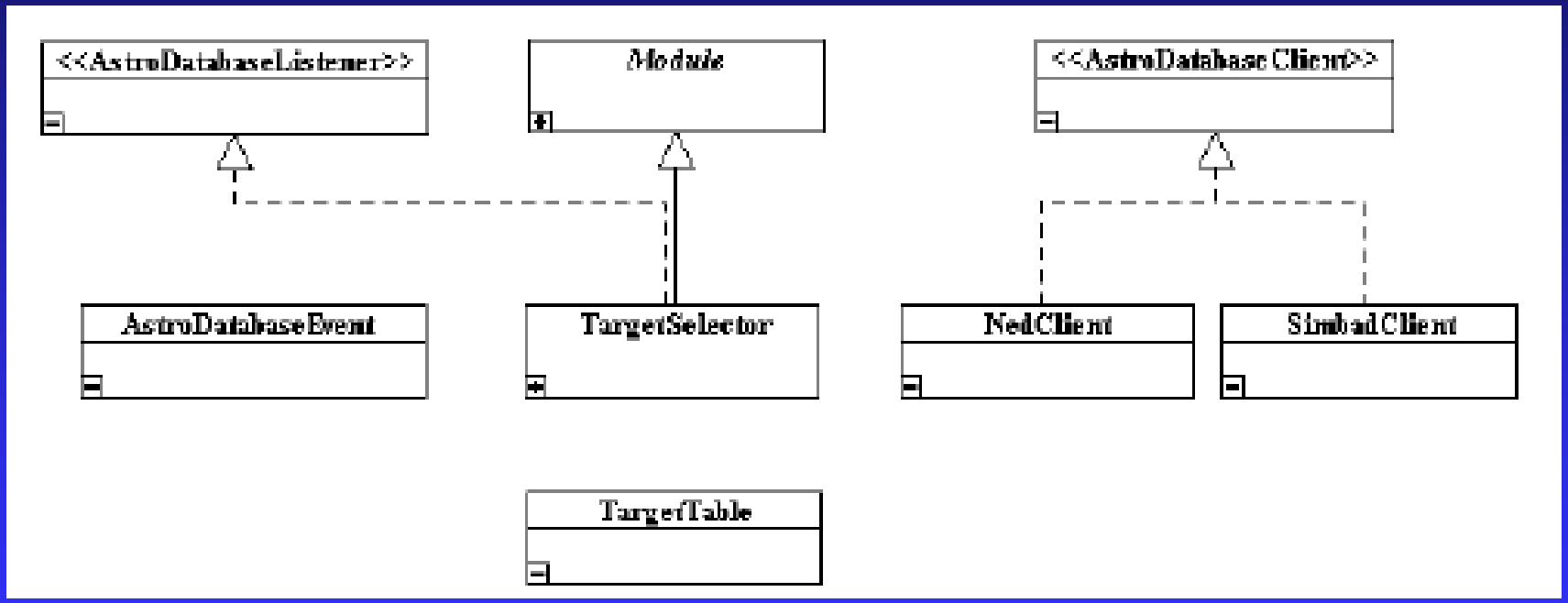
- A self-contained "Tool"
- Knows what displays to use
  - Individual GUI for each module
  - Same look & feel from common parent classes
- Examples
  - Exposure Time Calculator
  - Visual Target Tuner



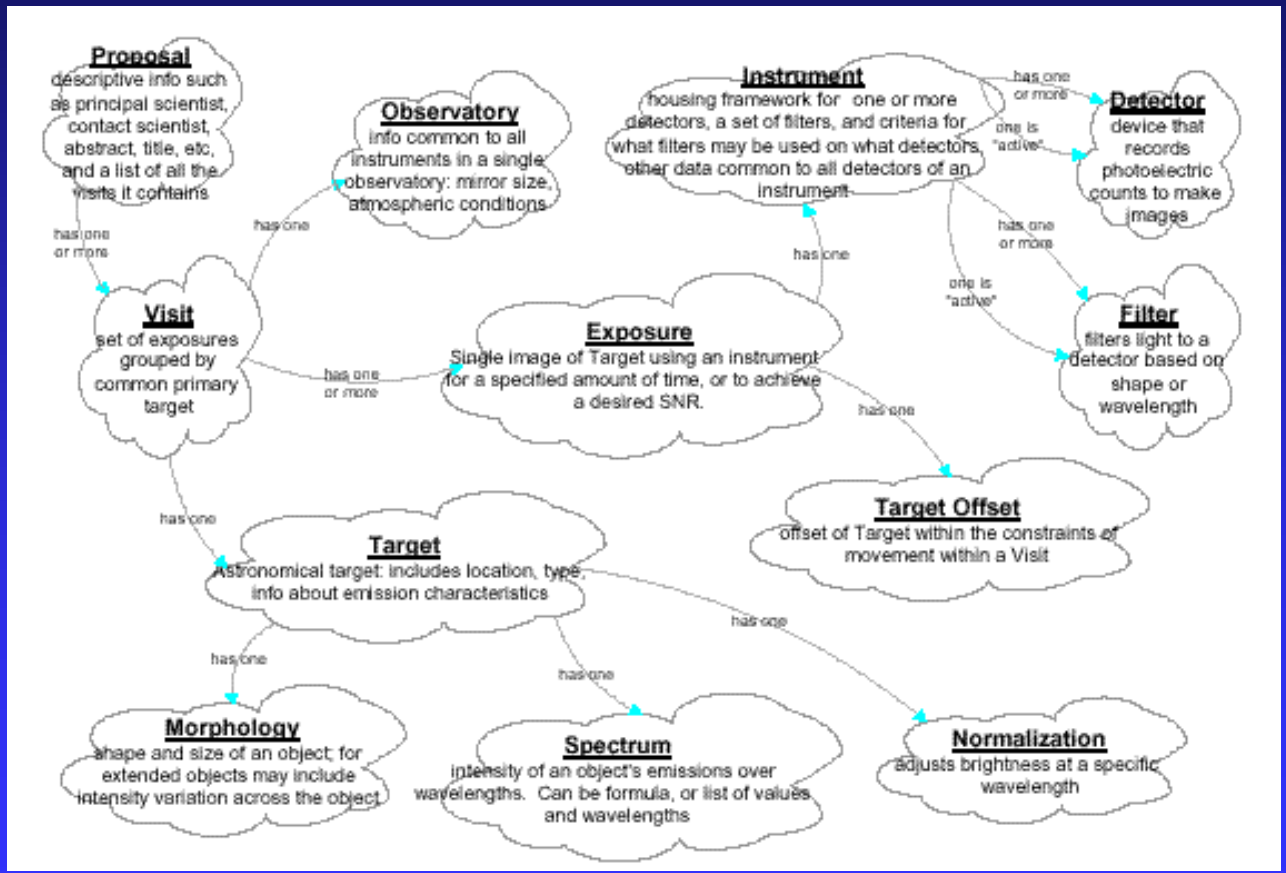
GUI Class Hierarchy



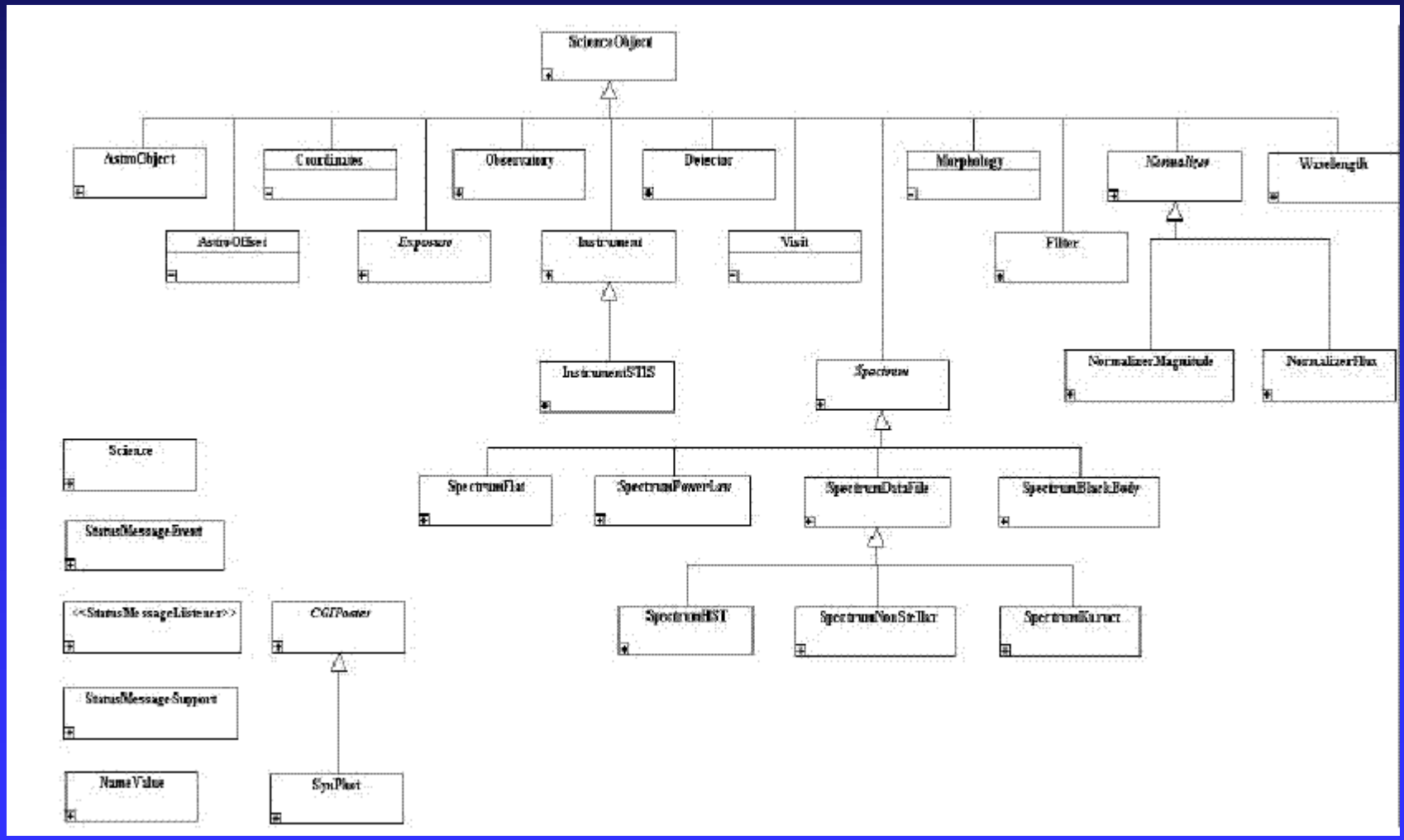
VTT/Target Selector Module Class Hierarchy

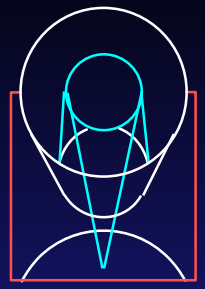


Science Data Model



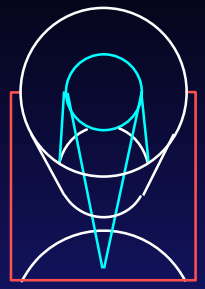
Science Data Model Class Hierarchy





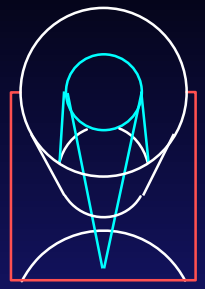
Events & Listeners

- Some GUI objects create a change in state for a data object.
- Other GUI objects register as event listeners for the particular data objects they display. Changes to those data objects then cause the GUI to update.



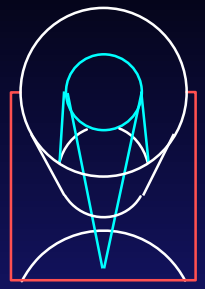
Anticipated Enhancements to the Architecture & GUI

- Connection to legacy systems
  - Trans – for orbit planning and overhead times
  - Spike – for schedulability and visit planning
  - NGSS – for Guide Star availability
  - Our experience with RPS2 and Distributed Object Controller indicate this is an important area for investigation
- Resolve Apply/Reset vs. Event/Listener issues
  - Some changes are too costly to propagate
  - Some changes need to update the view immediately
- Rework the GUI to be intuitive to HST users
- Add HST specific capabilities

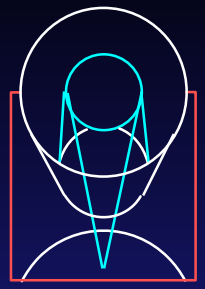


Anticipated Enhancements to the Architecture & GUI

- HST specific object hierarchy
  - Want to be able to share the hierarchy with other HST tools
    - Transverse
    - Starview
  - Will include separating proposal objects from astronomical objects
    - Visits and exposures are in the same package as instruments, detectors, and targets
- Proposal definition objects
  - E.g. there is a philosophy discussion on how targets, visits and exposures are related. The SEA took an approach that we are investigating, but preliminary analysis is that it is the wrong model for users.

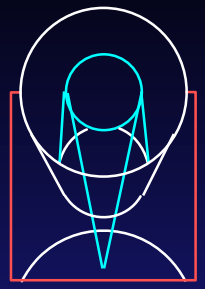


Reuse Strategy



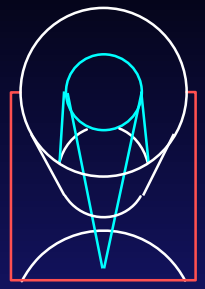
Strategy

- We will reuse much of the generic objects
- We will extend and re-design HST specific science class hierarchy
- APT began as wholesale reuse of the SEA, but we expect changes for the following reasons
  - Changes to support HST specific capabilities
  - Changes need to support new capabilities or to improve maintenance



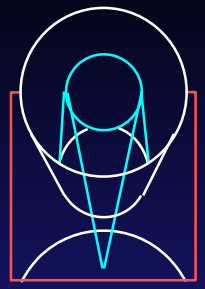
What we expect to reuse

- Visual Target Tuner
- Exposure Time Calculator
- Generic utilities
  - File readers
  - Database connectivity
- Astronomical utilities
  - Coordinate system objects
  - Generic Science hierarchy
    - Instrument/Detector/Aperture
    - Target/Wavelength
    - Exposure/Visit



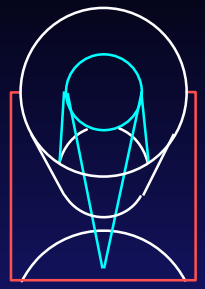
What we expect to reuse (continued)

- GUI widgets
  - Modules
  - Frames
  - Messages
- Items in the following packages will likely be reused:
  - GOV.nasa.gsfc.util
  - GOV.nasa.gsfc.sea
  - GOV.nasa.gsfc. sea.database
  - GOV.nasa.gsfc. sea.errcorr
  - GOV.nasa.gsfc. sea.event
  - GOV.nasa.gsfc. sea.science
  - GOV.nasa.gsfc. sea.targettuner
  - GOV.nasa.gsfc. sea.util

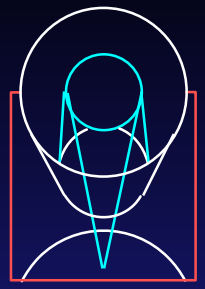


Making the Architecture more Re-Usable

- Currently working with Goddard SEA Team on reshuffling of data objects and packages.
- We see the separation of the infrastructure from the Data Model as an area where we can improve maintainability. This may just be a further shuffling of some packages to separate the two areas more logically.



Test Approach



Test Process

Unit, Integration, Documentation Testing

Code Configured

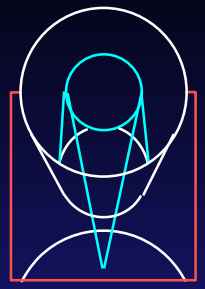
Developers & Scientists

Internal STScI Release

Scientific, Integration, Installation, Usability, & Documentation Testing

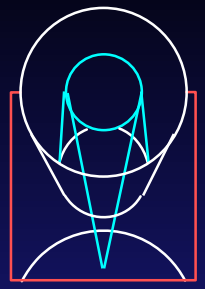
Testers & Scientists

External Release

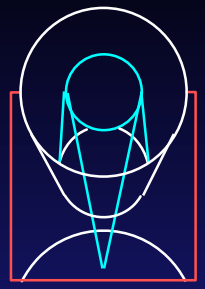


Development Supports Testing

- Trying for 6 week internal releases whenever possible
  - Smaller amount to test
  - Get new features into user and tester hands quickly
- Development performed on all the delivery hardware and Oss
- Installation Checks by developers on Personal Systems

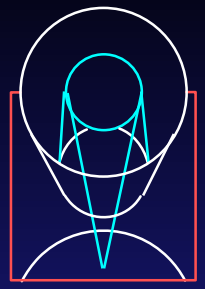


Manpower Effort & Schedule



Risk Management

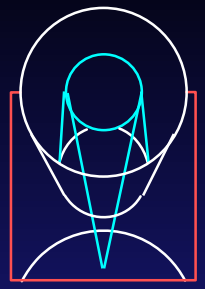
- STScI has existing tools to support Phase 1, Phase 2, and Archival Research
- Concentrate on Phase 2 Tools (RPS2 Replacement)
- Phased Release Schedule
  - Get user feedback as early as possible
  - Don’t deliver everything at once
- Study/Prototype areas of risk
  - Already studying different approaches to orbit planning



Release Schedule without Overguide

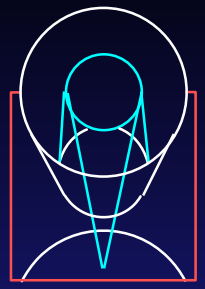
Tool \ TimeLine	Cycle 10 Phase 1 Jun 2000	Cycle 10 Phase 2 Jan 2001	Cycle 11 Phase 1 Jun 2001	Cycle 11 Phase 2 Jan 2002	Cycle 12 Phase 1 Jun 2002	Cycle 12 Phase 2 Jan 2003
Visual Target Tuner	X	X	X	X	X	M
ExpTime Calculator		X	M	M	M	M
Archival Research		X	X	M	M	M
Orbit Planner				X	X	M
Visit Planner				X	X	M
Top Level GUI		X	X	X	X	M
Architecture		X	X	X	X	M
Phase 1 Tool (Exp Time Calculators)		Replace ACS	Replace STIS, NICMOS	New WF3 & COS		
Current Phase 2 Tool (RPS2)		X		X		Replace RPS2

X – Release doesn't contain all major capabilities (Incremental Release)
M – Contains all major capabilities (Maintenance Mode)



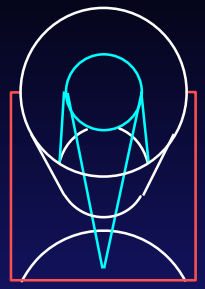
FTE Level without Overguide

TimeLine / Tool	Start Jan 00	Cycle 10 Phase 1 Jun 00	Cycle 10 Phase 2 Jan 01	Cycle 11 Phase 1 Jun 01	Cycle 11 Phase 2 Jan 02	Cycle 12 Phase 1 Jun 02	Cycle 12 Phase 2 Jan 03	Project Totals FTEs
Visual Target Tuner	2.5	1.5	1.0	0.5	0.5	0.5	Maintenance	3.25
Exposure Time Calcs	1.5	1.5	1.0	1.0	1.0	1.0	Maintenance	3.5
Archival Research		0.4	0.4	0.4	0.4	0.4	Maintenance	1.0
Orbit Planner		1.0 Oct.	1.0	1.0	1.0	1.0	Maintenance	2.25
Visit Planner			0.5	1.0	1.0	1.0	Maintenance	1.75
Top Level GUI		0.5	0.5	0.5	0.5	0.5	Maintenance	1.25
Architecture		0.5	0.5	0.5	0.5	0.5	Maintenance	1.25
Science Support	1.0	1.0	1.0	1.0	1.0	1.0	Maintenance	3.0
Testing/ Document Support	0.75	0.75	0. 5	0.75	0.5	0.75	Maintenance	2.0
Project Management	0.75	0.75	0.75	0.75	0.5	0.5	Maintenance	3.0
STScI Total FTEs	6.5	7.9	7.15	7.4	6.9	5.17	5	22.25



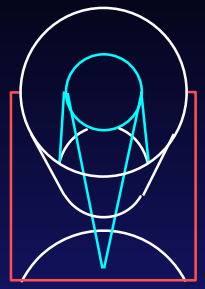
Areas of Technical Risk

- Will the Current Architecture Scale
  - No STScI legacy systems integrated
  - Need to integrate client/server methodology
- Achieving a responsive GUI when communicating to legacy systems and Databases at STScI
  - Orbit & Visit Planners need to be integrated
- Current SEA prototype already slow on Sun computers
  - No major compute engines hooked up
  - No client/server issues to legacy systems over internet



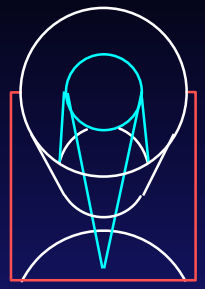
Overguide Benefits

- Minimize Technical Risk Earlier in the Project
  - Apply resources to integrating legacy systems
  - Apply resources to client/server
  - Apply resources to APT responsiveness
- Higher Quality Tool
  - Apply resources to testing
  - Apply resource to improved on-line user documentation
  - Apply resources to GUIs to Evaluate look/feel and usability



Overguide Benefits

- Two areas enter maintenance mode 6 months sooner
  - Orbit Planner Tool
  - APT Architecture
- Provides users with more on-line help capabilities
  - Help Wizards
  - Tool Tips
- More Fully Functional Phase 2 Cycle 11 tool



Release Schedule with Overguide

Tool \ TimeLine	Cycle 10 Phase 1 Jun 2000	Cycle 10 Phase 2 Jan 2001	Cycle 11 Phase 1 Jun 2001	Cycle 11 Phase 2 Jan 2002	Cycle 12 Phase 1 Jun 2002	Cycle 12 Phase 2 Jan 2003
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ExpTime Calculator		X	M	M	M	M
Archival Research		X	X	M	M	M
Orbit Planner				X	M (X)	M
Visit Planner				X	X	M
Top Level GUI		X	X	X	X	M
Architecture		X	X	X	M (X)	M
Help Wizards/Tool Tips		X	X	M	M	M
Current Phase 1 Tool (Exp Time Calculators)		Replace ACS	Replace STIS, NICMOS	New WF3 & COS		
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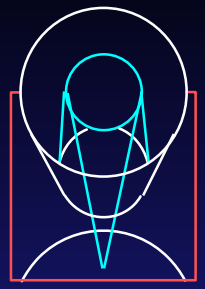

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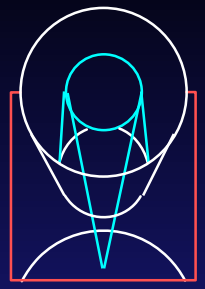
Exposure Time Calcs	1.5	1.5	1.0	1.0	1.0	1.0	Maintenance	3.5
Archival Research		0.4	0.4	0.4	0.4	0.4	Maintenance	1.0
Orbit Planner Overguide Support		1.0 Oct. 0.5 Oct.	1.0 0.5	1.0 0.5 Oct.	1.0	1.0	Maintenance	2.25 0.5
Visit Planner			0.5	1.0	1.0	1.0	Maintenance	1.75
Top Level GUI		0.5	0.5	0.5	0.5	0.5	Maintenance	1.25
Architecture Overguide Support		1.0 1.0 Oct.	1.0 1.0	1.0 1.0 Oct.	1.0	1.0	Maintenance	2.5 1.0
Improved Help		0.5 Oct	0.5	0.5 Oct.			Maintenance	0.5
Science Support Overguide Support	1.0	1.0 0.5 Oct.	1.0 0.5	1.0 0.5 Oct.	1.0	1.0	Maintenance	3.0 0.5
Testing/ Document Support Overguide Support	0.75	0.75 1.0 Oct.	0. 5 1.0 Oct.	0.75 1.0 Oct.	0.5	0.75	Maintenance	2.0 1.0
Project Management	0.75	0.75	0.75	0.75	0.5	0.5	Maintenance	3.0
STScI Total FTEs With overguide FTEs	6.5	7.9 3.5 Oct.	7.15 3.5	7.4 3.5 Oct.	6.9	5.17	5	22.25 25.75



More Information

- APT Project
  - http://ra.stsci.edu/apst/apt
  - krueger@stsci.edu