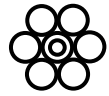


Software Systems

Jon Nielsen
Software Engineer
RSAA



The GMT software environment

- GMTO provides very little information about software requirements and interfaces
- We know that this is because they haven't made many decisions about software yet
- RSAA is, on GMTO's behalf and independently of our proposal for GMTIFS, undertaking a study of software systems at a number of other large telescopes
- From this will flow a set of recommendations to GMTO
- Expected completion by March 2010

Software for GMTIFS

- We need to make decisions about software for GMTIFS sooner than that
- We assume that GMTO will provide “just enough”
- Our proposal will therefore need to include everything else
 - Methodologies, specifications, design, implementation, testing
 - Every piece of software required to use and maintain the instrument
- But remember that every other instrument team is in the same position
 - There is tremendous scope for collaboration

GMTIFS Software for Scientists

- Preparation Tool
 - Easy to access
 - Intuitive to use
- Interactive GUI for classical observing
 - Control of every mechanism in a coherent fashion
 - Integration with other relevant subsystems (like AO)
 - Meaningful status display
 - Quick-look display of data

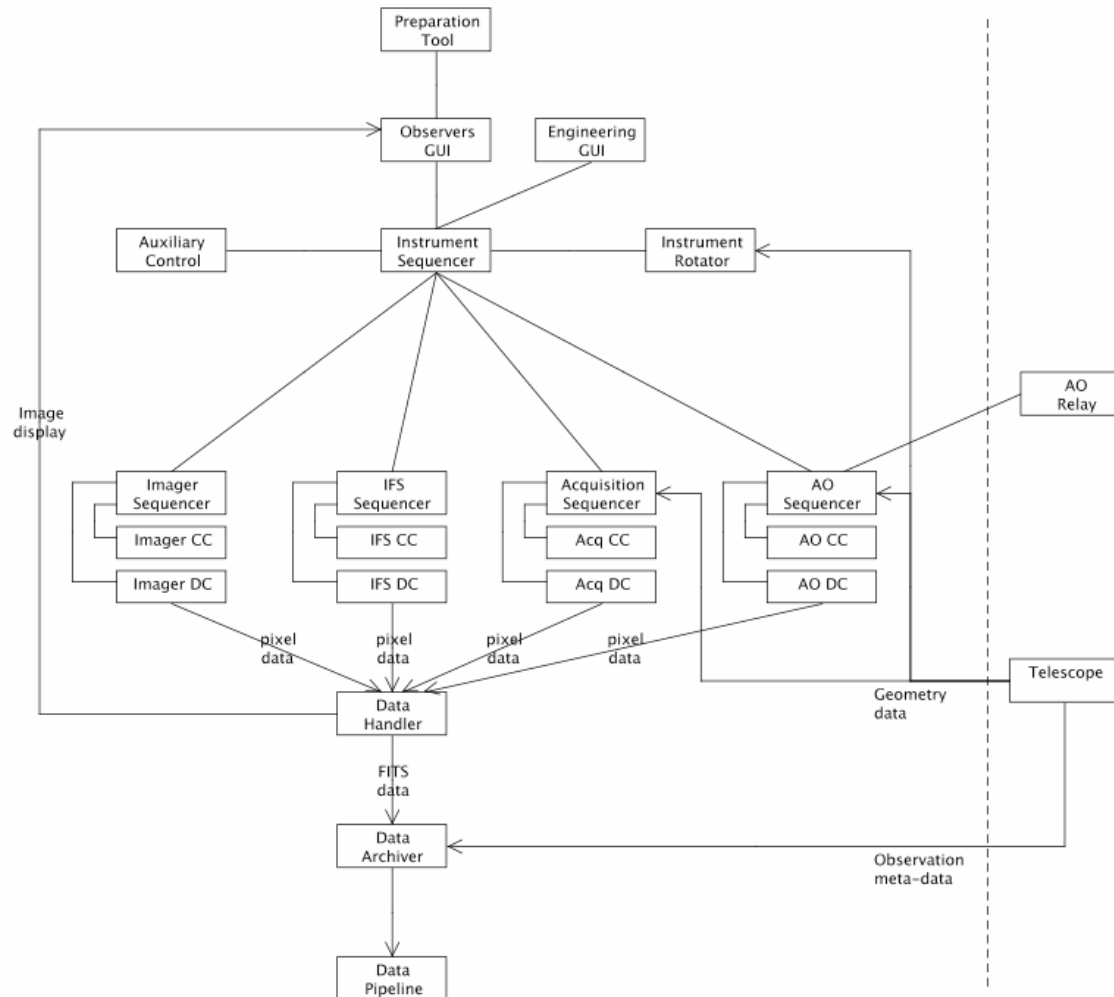
GMTIFS Software for Scientists

- Data Store
 - Easy to search and retrieve
- Data Reduction Pipeline
 - Fast
 - Consistent
 - Accurate

GMTIFS Software for Engineers

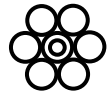
- Engineering GUI
 - Allows control over each mechanism individually
 - Reports status of everything that can return status
- Calibration
 - Calibration observations
 - Data reduction

Software overview diagram



GMTIFS Software Internals

- Sequencing
 - Sending coordinated sets of commands to mechanisms and detectors
 - Making sure mechanisms don't interfere with each other or with an observation
 - Taking sensible action based on status received
- Instrument Control
 - Turning high-level commands into something the mechanism or detector can understand
 - Interpreting the state of the mechanism or detector and providing meaningful status
- Data Handling & Archiving
 - Transforming pixel data into images that can be displayed and archived
 - Attaching relevant meta-data to each image



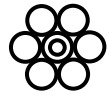
Frameworks

- If GMTO hasn't made a decision we should collaborate with other instrument teams to standardize as far as is sensible
- Communications / Middleware
 - RSAA has used JMS internally
 - CORBA (as used by ESO's Alma Common Software)
 - DDS - specifically designed for real-time systems (proposed for use by LSST)
- Instrument Control
 - EPICS and VxWorks (as used by Gemini)
 - LabVIEW (as used by SALT)
 - Many alternatives



Challenges

- RTOS for Adaptive Optics
- Software to interface with the Teledyne SIDECAR ASIC detector controller
- Choice of appropriate design, coding, testing methodologies
- Choice of appropriate frameworks for GUI, Middleware, Instrument Control
- Ensuring high reliability
- Safety of instrument and of personnel



Conclusions

- This is a big software project with a very broad scope and very few constraints
- We will be collaborating with other GMT instrument teams
- We will be making recommendations on software directly to GMTO
- The decisions we make will impact on the software systems for all of GMT