Starting a New Project at IPAC

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How I Learned to S
Worrying and
System Enginee

Overview

- Small Mission Paradigm
- System Engineering issues to consider
- Support from existing, particularly the larger, IPAC projects
- IPAC Systems Engineering Team
- Support from the ISE Team
- Possible directions for the future of system engineering at IPAC

Mission Paradigm at IPAC

- Old paradigm
  - *A few missions, mostly large*

- Current paradigm
  - *A dozen or so missions/projects*
  - *Mixture of large and small (although more small than large)*

- Potential future paradigm
  - *WFIRST*
  - *Many smaller missions/projects*

Impacts of the Small Mission Paradigm

- Smaller missions won’t **(don’t)** typically have the resources for a dedicated System Engineering team

- IPAC will have to move towards a more homogeneous system

- One type of solution will NOT work for all projects but we will need to develop a “library” of solutions which can be put in place and operated more efficiently

- Commonality of systems will allow for more exchange of hardware and more efficient support

System Engineering Concerns One Should Consider

- Hardware architecture

- Configuration Management
  - *Version Control*
  - *Problem Reporting*
  - *Process/Procedure*

- Driving Requirements
  - *Most costly*
  - *Most complexity*
  - *Most likely to keep you awake at night*

  - *Security*
  - *Schedule*
  - *Data Access Rate*
  - *Processing Latencies*

Least expensive hardware is frequently not the cheapest

- Other costs
  - *Set up*
  - *Maintenance*
  - *Operability*
  - *Upgrade*
  - *Replacement*

- “Cost” isn’t necessarily money
  - *Downtime*
  - *Schedule impacts*
  - *Grief*

Hardware

- Homogeneity of systems and commonality of solutions across IPAC are only going to become more important as we move forward

- Flexibility of hardware is important
  - *Having computers which can be used well enough in multiple parts of the system can be better than having multiple types of computers which are very good in only one place*

- Sub-systems architected out of hardware components, as opposed to all in one appliances, have many advantages, although they are frequently more expensive
  - *Easier to upgrade*
  - *More scalable*
  - *Reusability*

Hardware

- Vendor relationships are important
  - *We need to develop good relations with our vendors*
  - *We need to use vendors with whom we have a good relationship*

- Life cycle of a computer system in an operations critical role is typically three to five years
  - *Total lifetime may be much longer but it's best to keep older systems in less critical roles such as I&T or Development*

- New technology has its place
  - *New solutions should be evaluated but total costs must be considered*

- Innovation is important
  - *If a solution is better AND easier we may not be able to afford not to use it*
  - *It keeps people interested*

Configuration Management

- You need some!
- Make sure your process works for you
  - *Keep it as simple as possible*
    - No needless state transitions
    - Easy to use tools
    - Straightforward procedures
  - *If people are circumventing the system, your processes may be broken*
  - *Make sure (insist) you have buy in from everyone to use the system*
- The tighter and more aggressive your schedule the more rigorous your processes need to be
- CM mistakes are ultimately preventable

Support from Existing IPAC Projects

- Personnel
  - *Larger projects may have people they can spare part time*
  - *Smaller project may be able to share resources*

  - *Database Administration*
  - *Integration and Test*
  - *Configuration Management*

- Software packages and the expertise to use them
  - *Load test software (Silk Performer)*
  - *Automated testing packages*
  - *CM tools*
  - *Helpdesk systems*

- Lessons Learned

Hardware Support from Existing IPAC Projects

- Downsizing or ending projects will likely have hardware which can be used

- Projects with big clusters may have production cycles on those systems which can be utilized by another project

- Old production hardware can make really good testing and development hardware

- In a pinch, old production systems can still be used in production as long as you’re aware of the risks

IPAC Systems Engineering

- Lee Bennett, Eugean Hacopians, Jonathan Kakumasu, Jack Lampley, Steve Schurr, Hector Wong, Winston Yang

- Charter
  - *Data/Ground System Architecture*
  - *Networking*
  - *Security*
  - *Data Center Management*
  - *Block Times*
  - *Server Configuration*
  - *Backups*
  - *LDAP / DNS*
  - *Storage*
  - *System Monitoring*

What can the ISE Team help you do?

- Proposal phase
  - *Scoping hardware needs and requirements*
  - *Costing hardware systems*
    - Both initial costs and long term costs

- Planning/Development phase
  - *Developing a system architecture*
    - Initial designs
    - Design refinements as the project moves through development
  - *Setting up, configuring and managing your system*
  - *Helping you find any spare hardware from other projects*

- Operations
  - *Continued management and upgrades of the system*
  - *Monitoring and refinement of the system to squeeze out extra performance*

What Does the ISE Team Need From You

- Requirements
  - *Driving Requirements*
  - *Reasonable Data Volume Estimates*

- Use Cases
  - *How will your operations team use the system?*
  - *How will your users/observers use the system?*
  - *Who are your users?*

- Help us understand your data flow

- Help us understand your processes

The Future

- Multi mission services
  - *Integration and Test*
  - *Configuration Management*
- Pooled resources such as the storage currently used for science home directories and various science projects
- Shared processing clusters
- Offsite commercial resources