Tackling 5 main problem areas found in science (ground segment) project developments.

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Abstract

Science projects which require a large software development may use many scientists alongside a few professional software engineers. Such projects tend to show extreme cases of the general problems associated with software developments.

Introduction and Scope

An example of a large software development for a science project could be a science ground segment for a space telescope. An example of a recent such telescope is Herschel. The science ground segment for Herschel consisted of a core centre, taking care of the observation capture tool, observation handling and a mission planning tool, as well as data processing, in collaboration with dedicated instrument team sites. The development was distributed between the teams and sites. The clearly scientific nature of the overall project meant that many scientists were involved in the development of the science ground segment, which includes the core site and the participating instrument sites.

The 5 main, common problems

1. **Vague, late and missing requirements.**
2. **Few professional software engineers in a large software development.**
3. **A lack of testers and an appropriate test mentality.**
4. **Quality Assurance people cannot be everywhere, nor have in-depth skills in every subject.**
5. **Scientists will want to start coding and see writing documents as a waste of their time.**

What to do

➢ The development of a science operations centre or science ground segment, these days, is nothing new.
➢ Many problems will be found along the way. Above, just five of the common problems are listed.
➢ For any such project, a development management plan is produced.
➢ The key is to address the problems before they occur by clear planning and preparation set out in simple, honest terms in the development management plan from the very beginning.
➢ The development management plan needs to cover, at least, the following main topics and areas:

- Organisation and team members
- Development life cycle
- Development standards
- Engineering guidelines
- Requirements management
- Configuration management
- Support tools
- Verification and validation policy
- The quality model and QA programme
- Reviews
- Schedule

Problem area/what to do - details	Focus areas in the development management plan
1. Vague, late and missing requirements. Use an iterative development life-cycle. Scope carefully the requirement capture and maintenance effort. Use experienced people. Always add context and simple intended meaning of the requirement in comment field.	Life-cycle Requirements management Team members Support tools
2. Few professional software engineers in a large software development. Careful placement of professionals in key positions. Provide all team members with one engineering/development guidelines document, based on an 'easy to understand' tailoring of management and engineering standards. Have QA support the production of the guidelines document and use QA through the development to guide, support and monitor team members	Organisation and team members Development standards Engineering guidelines document The quality model and QA programme
3. A lack of testers and an appropriate test mentality. Define the full test (V&V) policy and approach for the whole project period in the Development Management Plan and have QA and an experienced test engineer guide the policy and approach.	Organisation and team members Verification and validation policy Engineering guidelines document The quality model and QA programme Support tools
4. Quality Assurance people cannot be everywhere, nor have in-depth skills in every subject. Produce the Development Management Plan with direct experienced QA support from the beginning.	Organisation and team members The quality model and QA programme
5. Scientists will want to start coding and see writing documents as a waste of their time. Define a documentation tree at the very beginning of the project. Provide a template for every required document. Emphasize that documents are to record important information which others may depend on later, even themselves.	Engineering guidelines document

There is no magic to developing a centre suitable to support successful science operations.

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