



CASE STUDY

KECK OBSERVATORY:

W.M. Keck Observatory uses Contour to build the world's most powerful space telescope.

If there is planetary life to be found outside of our solar system, you can bet that the W.M. Keck Observatory will play an important role in discovering it. Perched on the summit of Hawaii's dormant Mauna Kea volcano, the twin telescopes at the W. M. Keck Observatory probe the deepest corners of the universe with great precision and power.

As the world's largest optical and infrared telescopes, each of them stands eight stories tall and weighs 300 tons, yet operates with nanometer precision. Made possible through grants totaling more than \$140 million from the W. M. Keck Foundation, the Observatory is operated by the California Association for Research in Astronomy in partnership with NASA.

Recently we chatted with Erik Johansson, an adaptive optics software engineer at Keck, and asked him a few questions about how Contour helps his team manage all the complex requirements that go into developing the sophisticated software used to control the powerful Keck telescopes. about Stonesoft's product development process and their reasons for selecting Contour.

What are the goals of the projects you're managing within Contour? Tell us a little bit about the products your team is building.

This requires a little background explanation. Keck Observatory is recognized as the world leader in the use of adaptive optics for ground-based astronomy. Adaptive optics (AO) is the real-time computer control technology that compensates for the blurring effects of the earth's atmosphere on astronomical images.

Without AO, our telescopes would have essentially the same resolving power as that of an amateur astronomer's backyard telescope. AO allows us to achieve the full resolving power of the giant 10 meter primary mirrors of the Keck telescopes. You may recall seeing recent news reports of the first-ever direct imaging of planets outside of our own solar system. The Keck AO system played a major part in this discovery.

For example, in this image, three exoplanets orbiting a young star 140 light years away are captured using Keck Observatory near-infrared adaptive optics.

One of our current projects is to design the Next Generation Adaptive Optics system (NGAO), which will help keep Keck Observatory at the forefront of AO-based astronomy in the years to come.

It is a large multi-year, multi-million dollar project with a design team spanning multiple institutions separated geographically – including Hawaii, Northern California and Southern California.

We are using Contour to manage all of the requirements for this new system. We are currently in the preliminary design phase of the project, having passed our conceptual system design review in April 2008.

How large are your projects in terms of requirements & size of team?

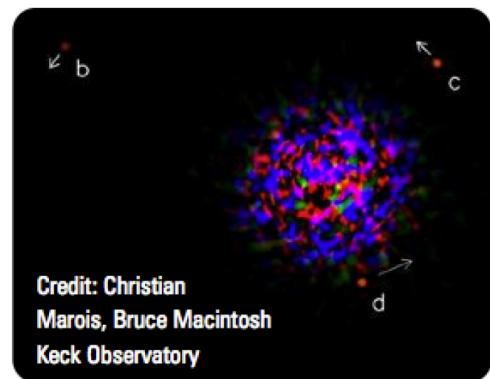
Our NGAO core design team has 8 people on it, while the full team has about 20 people. We currently have several hundred requirements, but expect that to increase significantly as we add to the functional requirements during the preliminary design phase.

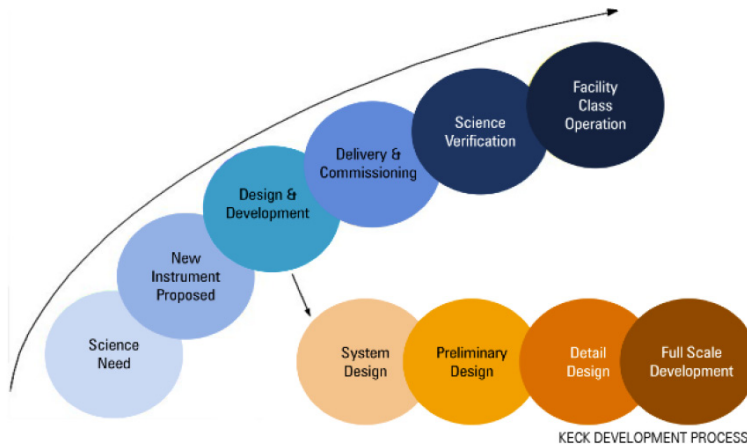
What development process do you use?

We have a standard development process for large projects and instruments (shown on the next page). It is important to note that this process is for large multi-disciplinary projects that include mechanical, electrical/electronic, optical and software engineering components, so the overall development process is different than most pure software projects. For our software projects, depending on the size and scope, we typically use a modified waterfall process, but also starting to adopt agile techniques where possible.

**"Contour is flexible,
easy-to-use & gives us
complete traceability of
our requirements."**

Erik Johansson,
Software Engineer, Keck





What's the biggest challenge you and your organization face in managing this process?

Our biggest challenge is balancing the need to press forward with the design even though some of the basic requirements are in a constant state of flux.

How has Contour helped you be more successful?

Contour has allowed us to capture our requirements into a centralized

solution that is easily accessible by our geographically separated design team. In the past we have used a simple database approach to try to manage requirements. We have also used Microsoft Excel spreadsheets and MS Word documents. These methods were not flexible and did not allow for good configuration management.

Contour is flexible, easy to use, and has configuration management capabilities. Contour also gives us complete traceability for our requirements. We use a hierarchy of requirements: science requirements at the top, system requirements based on the science requirements, and finally detailed functional requirements from which the system can be designed. We can now relate every functional requirement back up to a parent system requirement and finally up to a parent science requirement, giving us the ability to assess the impact of making requirements changes. Finally, we are able to attach supporting documents or links to each requirement, so that all the information needed to assess a requirement is available in a single place.

Jama Software is the leader in collaborative requirements management solutions for improving enterprise collaboration and managing complex software development projects. Its Web application, Jama Contour, helps organizations manage the entire requirements management lifecycle through an intuitive, easy-to-use interface that brings people, process and data together to ensure software quality is delivered as specified.

Customers, from agile start-ups to the largest and most sophisticated technology and IT organizations in the world, turn to Jama to help drive innovation, improve the decision-making process and harness the collective genius of all stakeholders involved in building great software. For more information please visit: <http://www.jamasoftware.com>.