

Equinox helps NASA Improve Efficiency of Interplanetary Missions

NASA is a longtime user of Eclipse Rich Client Platform (RCP) as the platform for many of their operations systems - the desktop interfaces that scientists use to communicate with unmanned spacecraft sent on interplanetary missions like the Mars Rover mission. In fact, a portion of the operations tools for all Mars surface missions use Eclipse for tasks such as controlling and receiving data from rovers. NASA has recently chosen Equinox and OSGi to extend these systems to provide even more power and flexibility to the mission scientists who use them.

While a desktop and Eclipse RCP approach has been very successful, NASA recently began to explore strategies to improve efficiency by selectively moving some desktop functionality to servers. A good example is complex image analysis that can involve large amounts of data being sent between the client and server. Moving this information to clients was expensive, both in bandwidth and local resources on PCs.

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Blending Server and Client Functionality

So starting in the summer of 2007, the team at the Jet Propulsion Laboratory in Pasadena, California, the leading US center for robotic exploration in the solar system, began experimenting with Equinox and OSGi to explore its feasibility as a framework for migrating

RCP plug-ins to a Linux server environment. This migration will let them take better advantage of server processing power while lightening the various clients used in mission operations.

Tierless Computing

They found it very straightforward to move existing RCP plug-ins to a server running Tomcat and Equinox. The common component model shared between RCP and server side Equinox made this process easy. In fact, NASA is now able to develop an Equinox component and decide upon the

deployment platform at a later date; an approach that can be thought of as tierless computing.

Key to this approach is the consistent Eclipse tooling support for developing desktop or server components. The JPL team makes use of Jetty, a lightweight Java-based server that runs on an Equinox service within the Eclipse IDE. This allows them to develop, test and debug a component without worrying about the deployment platform.

Confident Updating

NASA tries not to change operational code during a mission, but they know that the day may come when they have to. With years of effort and hundreds of millions of dollars invested in a typical unmanned mission, knowing that any change to a live system will not have unanticipated side effects is critical. Equinox gives them the ability to selectively update an existing plug-in on the server without needing to restart. Just as importantly, the OSGi framework allows them to map out dependencies and reliably see what impacts a change will have to a running, mission critical system. Without this robust knowledge of dependency relationships, it would be far more difficult for NASA to make changes to live missions.

Leveraging Components

NASA is very conscious of how they spend public funds on development efforts. Beginning with Eclipse RCP, JPL has built up a substantial library of Equinox components that developers on any project within NASA can reuse, saving considerable effort and money. For example, many projects involve command and control systems for robotics, either for space exploration or under contact for military operations.

Developers on these projects select from a significant pool of components, which they can extend and customize. Since Equinox server components have similar reuse characteristics, they hope that a similar approach will take root and that, over time, they will build up a substantial library of reusable components for Equinox on the server.

Mars Missions

So far, the Equinox/OSGi approach has been successful for NASA. Server-based functionality will be used by scientists on the ongoing Spirit and Opportunity Mars Exploration Rover mission, the Phoenix Mars Lander mission which launched in 2007, and the Mars Science Laboratory Rover mission which launches in 2009.

Given this early confidence in Equinox as a server environment for mission critical applications, its future at NASA looks bright.

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March, 2008