Use of the NetBeans Platform for NASA Robotic Conjunction Assessment Risk Analysis

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Note: These slides will be moved into the JavaOne template prior to presentation
NASA Robotic Conjunction Assessment Risk Analysis (CARA)

• CARA is the process and team for:
  – Determining the risk of collision between two orbiting objects
  – Assisting with risk mitigation (typically, via an orbital maneuver)

• The NASA Robotic CARA group at NASA GSFC provides this support to all operational NASA robotic (unmanned) missions
  – Started in January 2005
  – Over 65 missions in total
  – Over 1,000 close approach messages received per day
  – Maneuver recommendations result in as many as 30 realized maneuvers each year
NASA Robotic Conjunction Assessment Risk Analysis (CARA)
The Joint Space Operations Center (JSpOC) is a USAF operational unit that is responsible for maintaining the locations of all objects in space.

- For NASA, the JSpOC identifies close approaches between those objects and provides data to CARA to enable the collision risk assessment.
- The JSpOC operates in a secure environment.
  - i.e. only accredited or in-house software; accreditation can take more than 6 months.

CARA has an analyst/developer resident at the JSpOC to access data which cannot be sent to NASA.

- Able to develop NASA-specific products and services.
  - i.e. development of space weather risk trade space, orbit quality data product.
- Symbiotic relationship between NASA and USAF/JSpOC.
  - i.e. developed automation and improvements to legacy software components.
NetBeans for CARA JSpOC Support

- JSpOC development & support provided by a single developer
  - Scope of project would not have been possible without the use of a Rich Client Platform (RCP)
  - NetBeans was intuitive, and provided excellent support
- Initially developed using NetBeans 7.3.1
  - Provided significant UI features with little to no code
  - Scalability from plugin architecture
  - Platform API reduced coding time substantially
    - Nodes, Module, Lookup, and FileSystems APIs used extensively
  - Reused existing platform modules developed for other a.i. solutions projects
  - Interfacing with legacy and supporting software very easy
Upgrading to Java 8 / JavaFX 8

• No software changes required to update to JDK8
  – i.e. nothing broke

• We are adding some of the new JDK 8 features to our application as part of the upgrade:
  – Stream API and Lambdas
    • Reduction in code / simplified syntax
    • Simplifies our use of collections
    • In the process of adding substantially more parallelism
  – JavaFX 8
    • No prior access to JavaFX on our system
    • JavaFX has been approved along with JDK 8
    • Experimenting with both 3D and 2D visualizations
JFX 8 OD Quality Visualization Demo*

*Note: This will be an interactive demo, with all data being simulated