SAND2017-1968C

ENGINEERING SCIENCES WORKFLOWS FOR V&V APPLICATIONS

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SIAM/CSE

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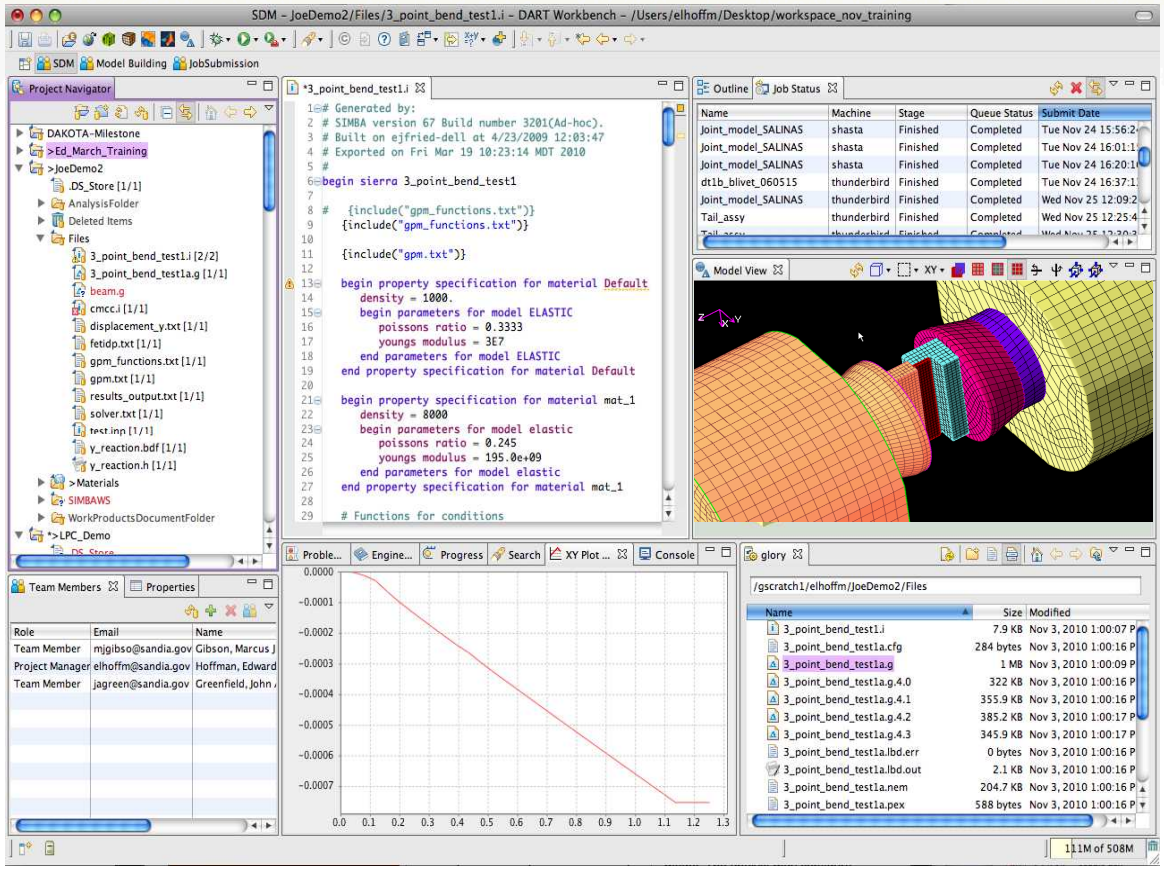
The Sandia Analysis Workbench

An integrated environment for engineering analysis



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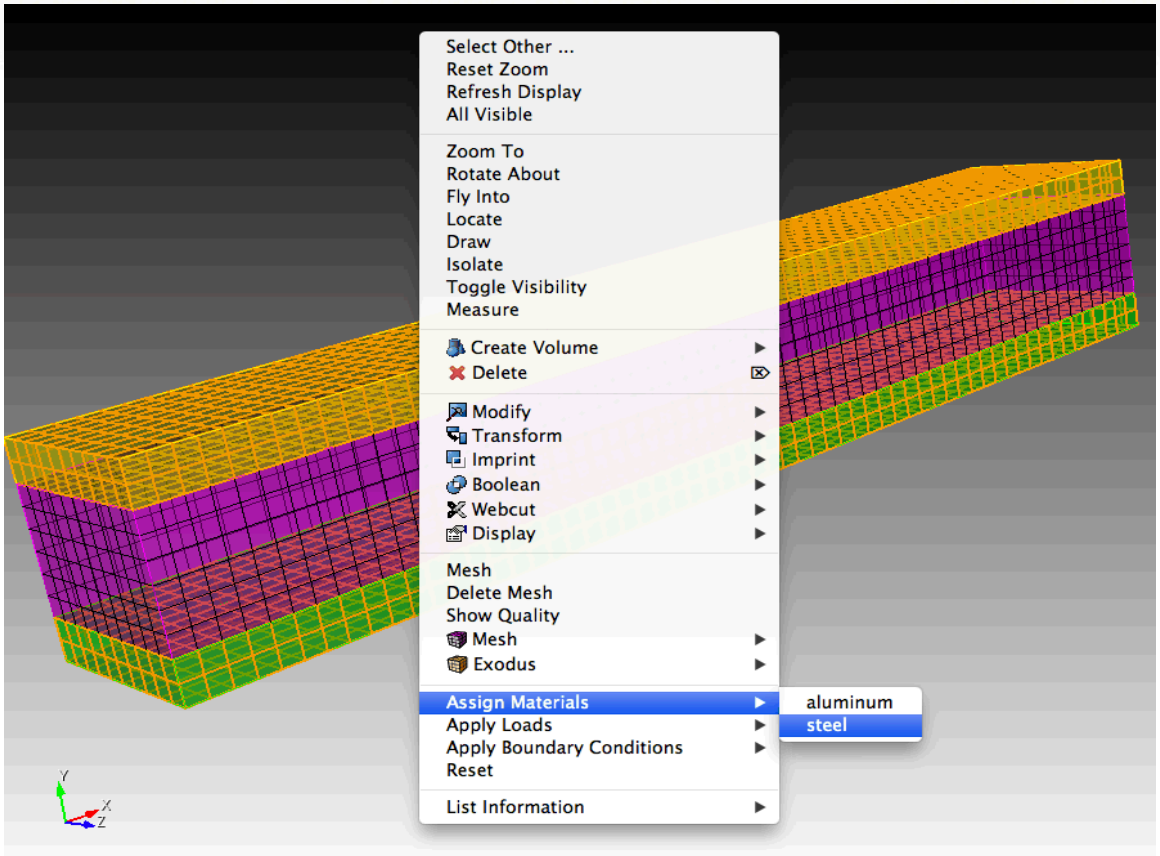
Model Building

Graphical model building for many in-house codes including the Sierra suite and CTH



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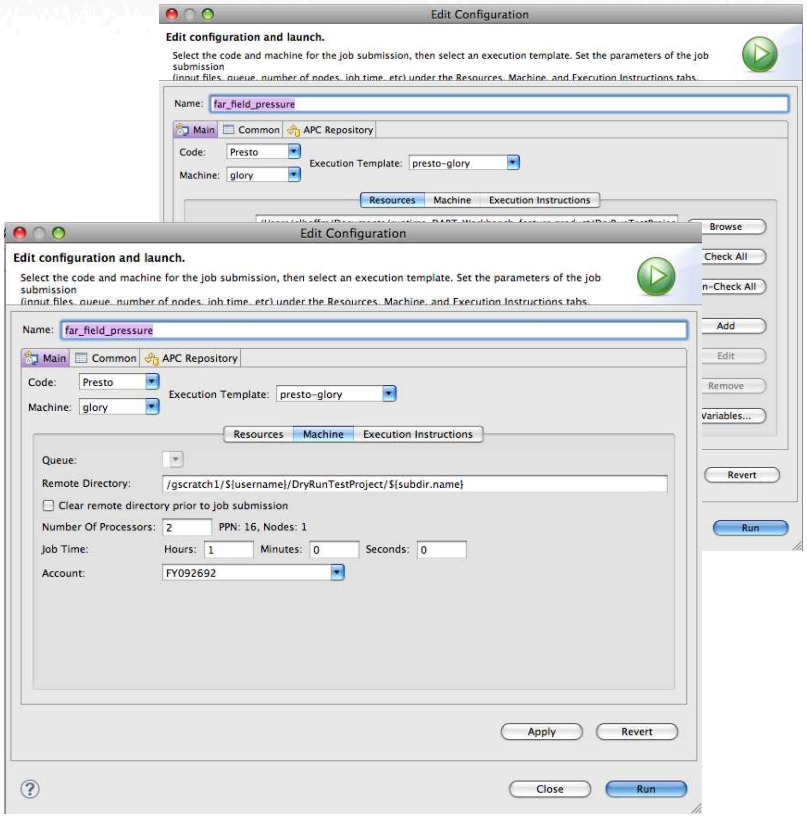
Job Submission

Template driven, easily user customized, makes access to heterogeneous resources uniform



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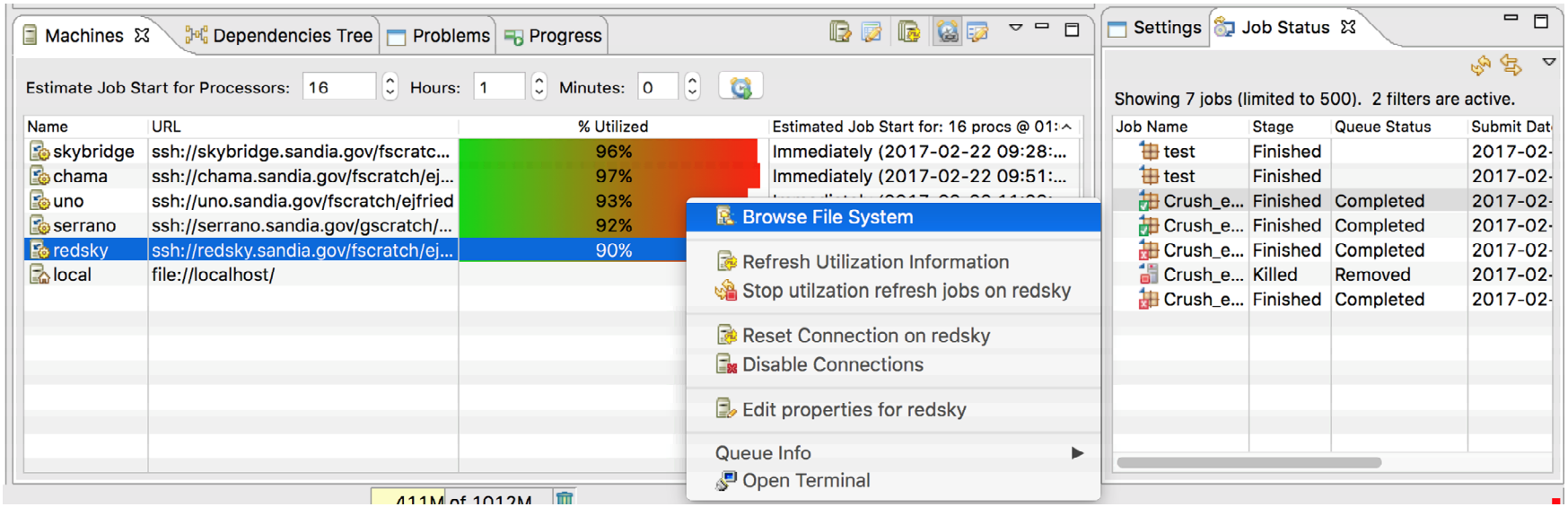
Job Monitoring and Distributed File Management

Debug, track, and access jobs



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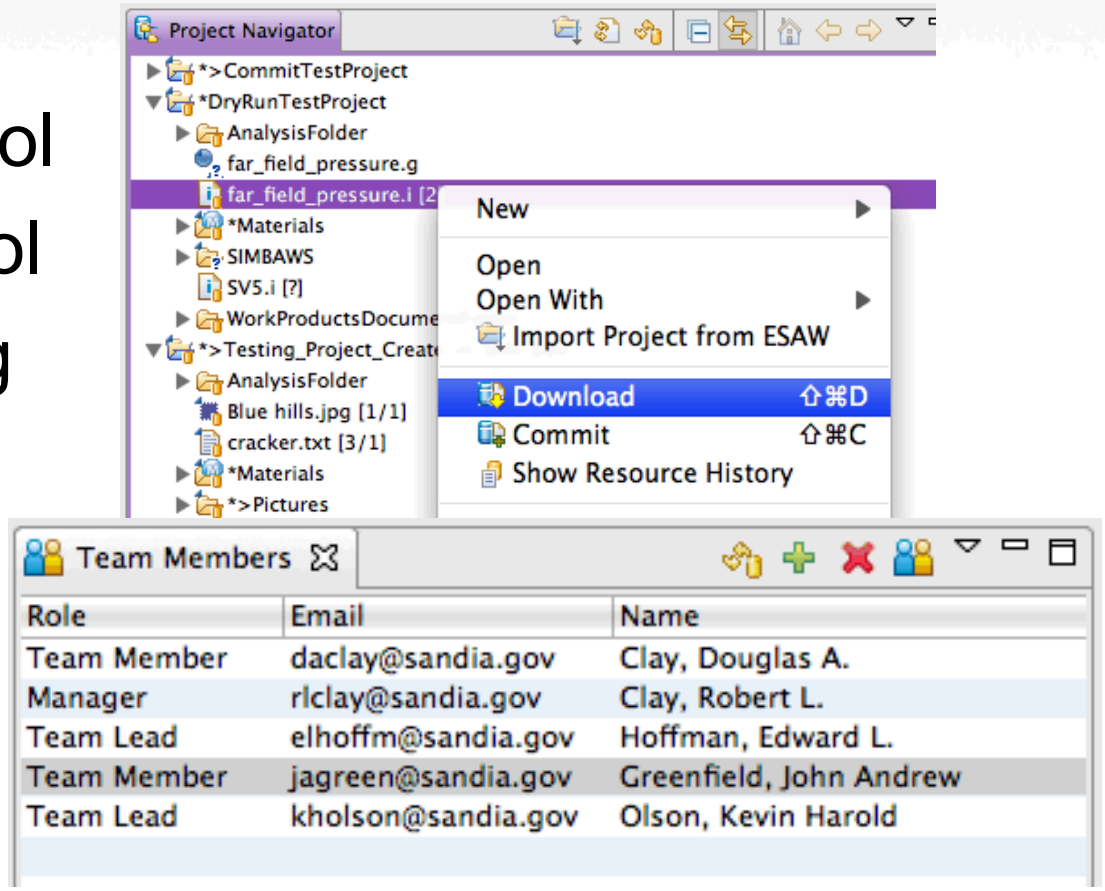
Scientific Data Management

- Version control
- Access control
- Team sharing
- Repository search



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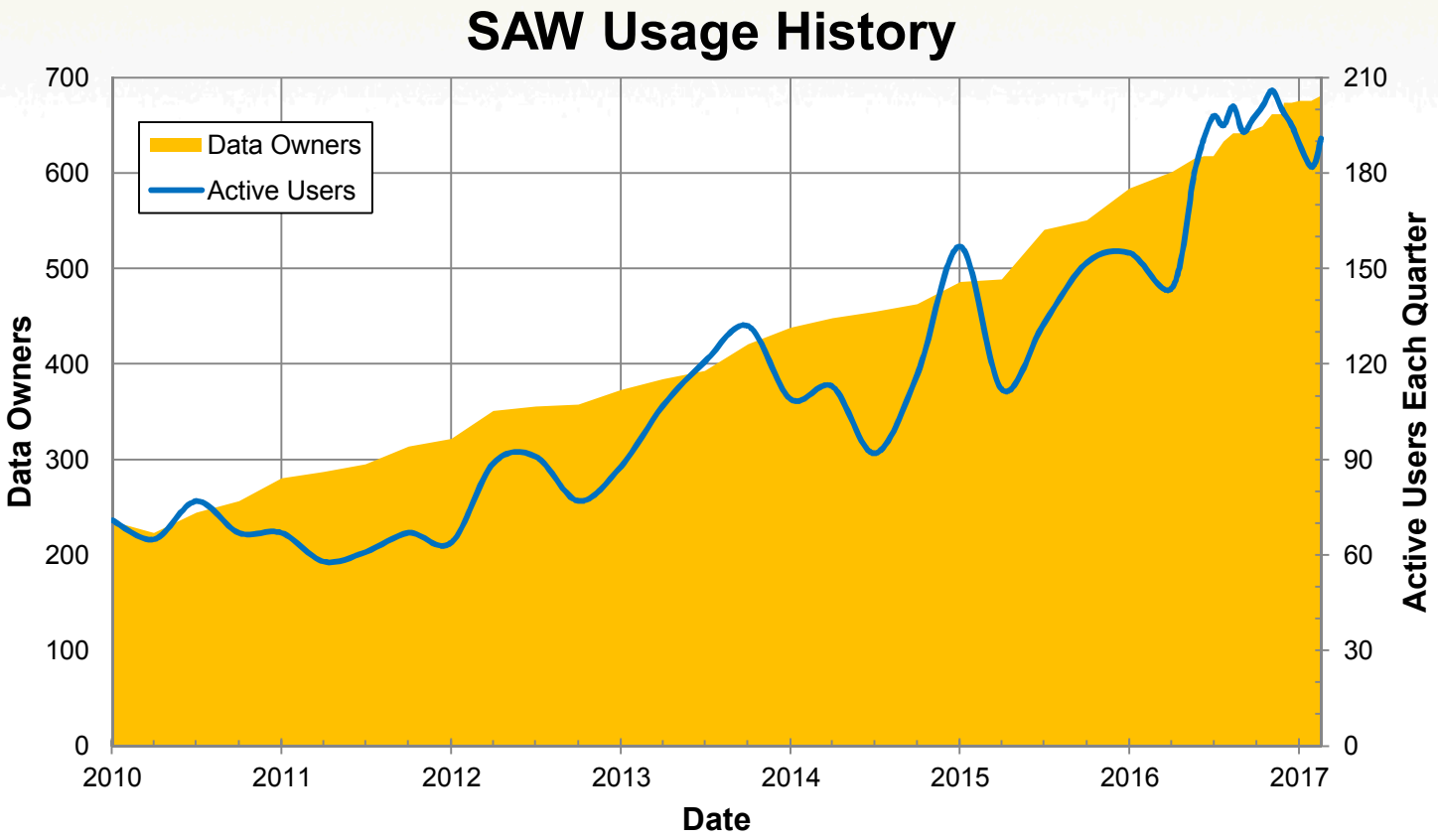
Metrics show widespread adoption of SAW



Data are for internal Sandia users only

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New Challenges

Ensembles

…of multi-step processes

…with constant variations

…often needing manual intervention

…running on unreliable machines

…providing high-consequence evidence

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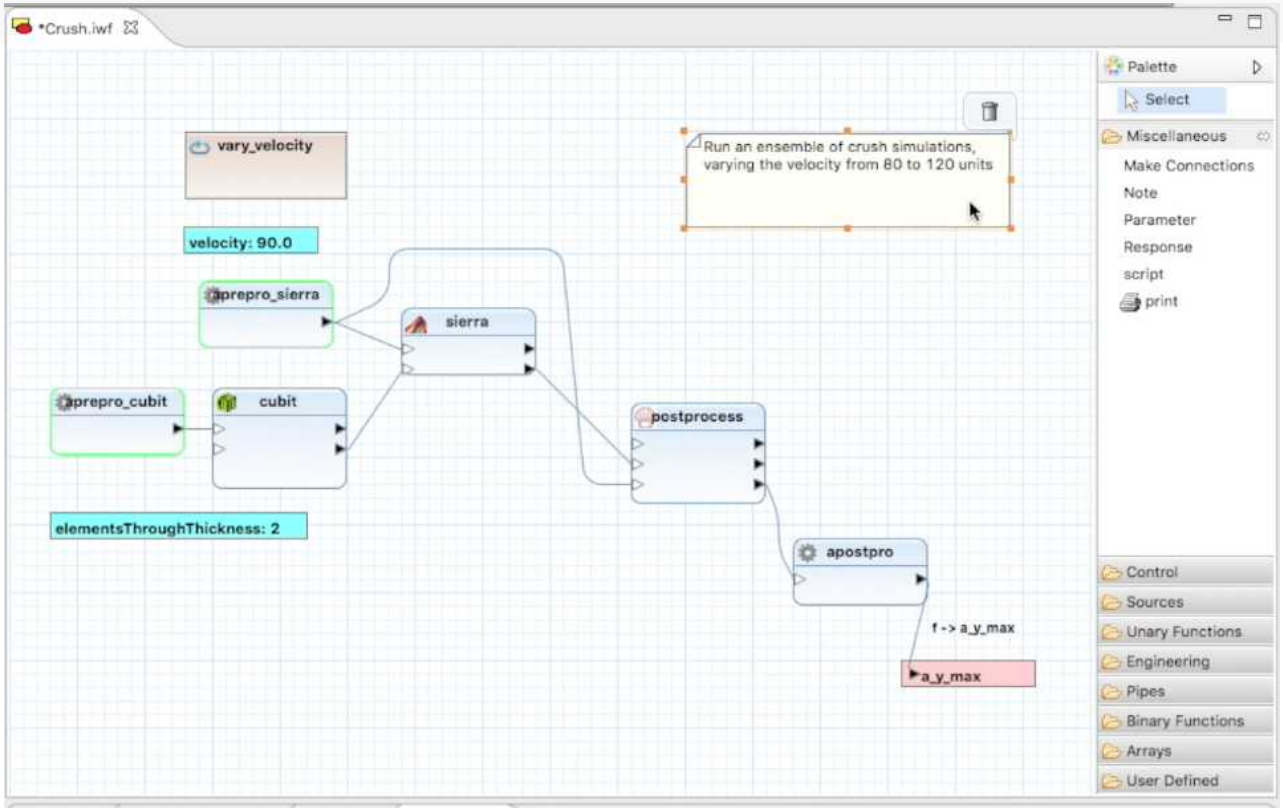
The Solution

Automated workflow… integrated with everything else in SAW



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Workflow System Requirements

- Workflow engine independence
- Minimal server installation
- Flexible system architecture
  - “Everything executes anywhere”
- Low cognitive load
- Transparent and escapable

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SAW Workflow Architecture

- Graphical Workflow Editor
  - Leverages some tech from Triquetrum/ESWG
  - Data-driven
- Workflow Runtime
  - “Abstract dataflow” (exoscale)
  - Integration layer for workflow engine independence
  - Highly portable

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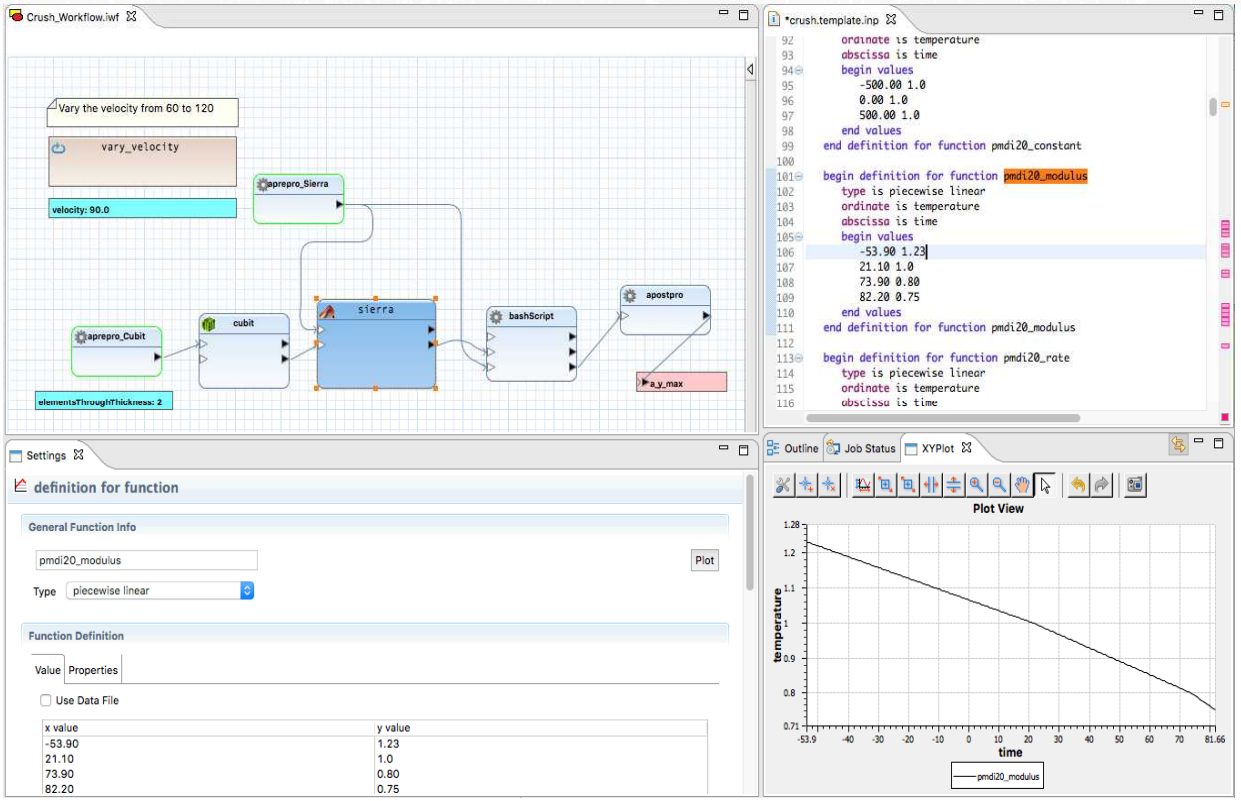
Model Building

Edit model components naturally using familiar tools



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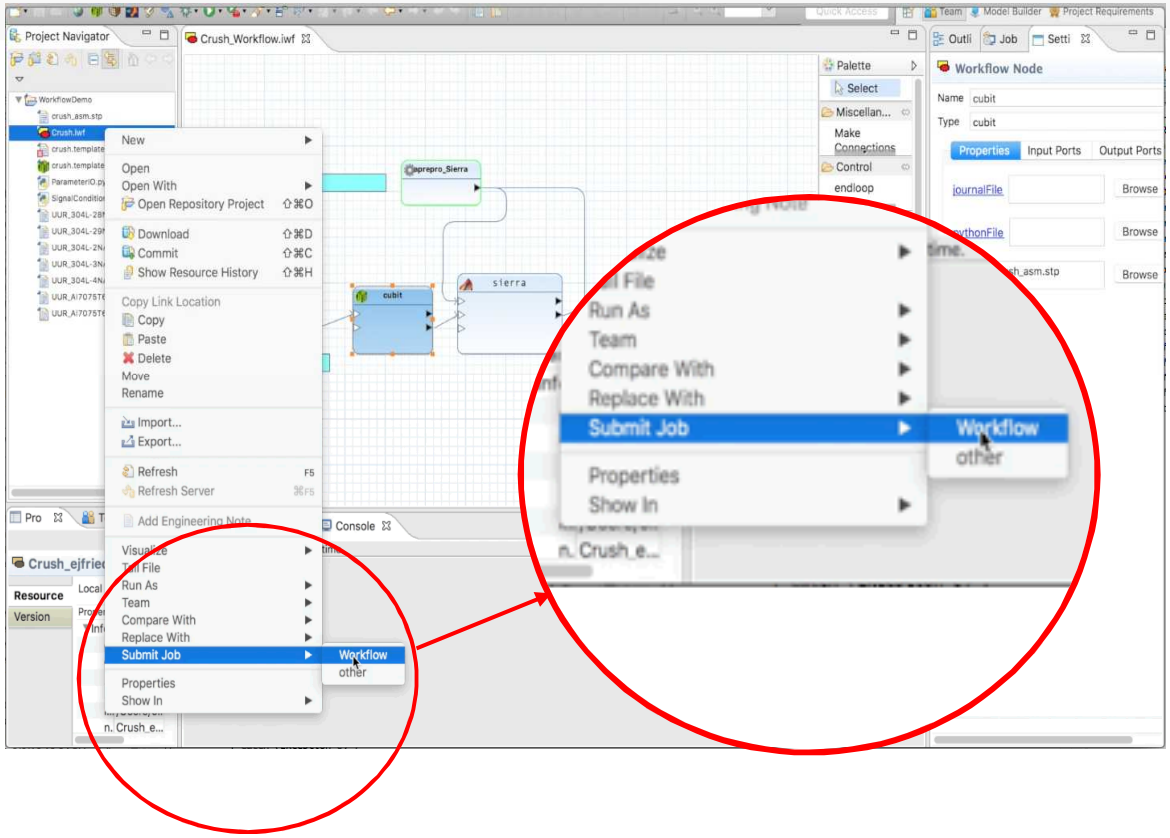
Job Submission

Workflow executed locally or remotely using SAW job submission



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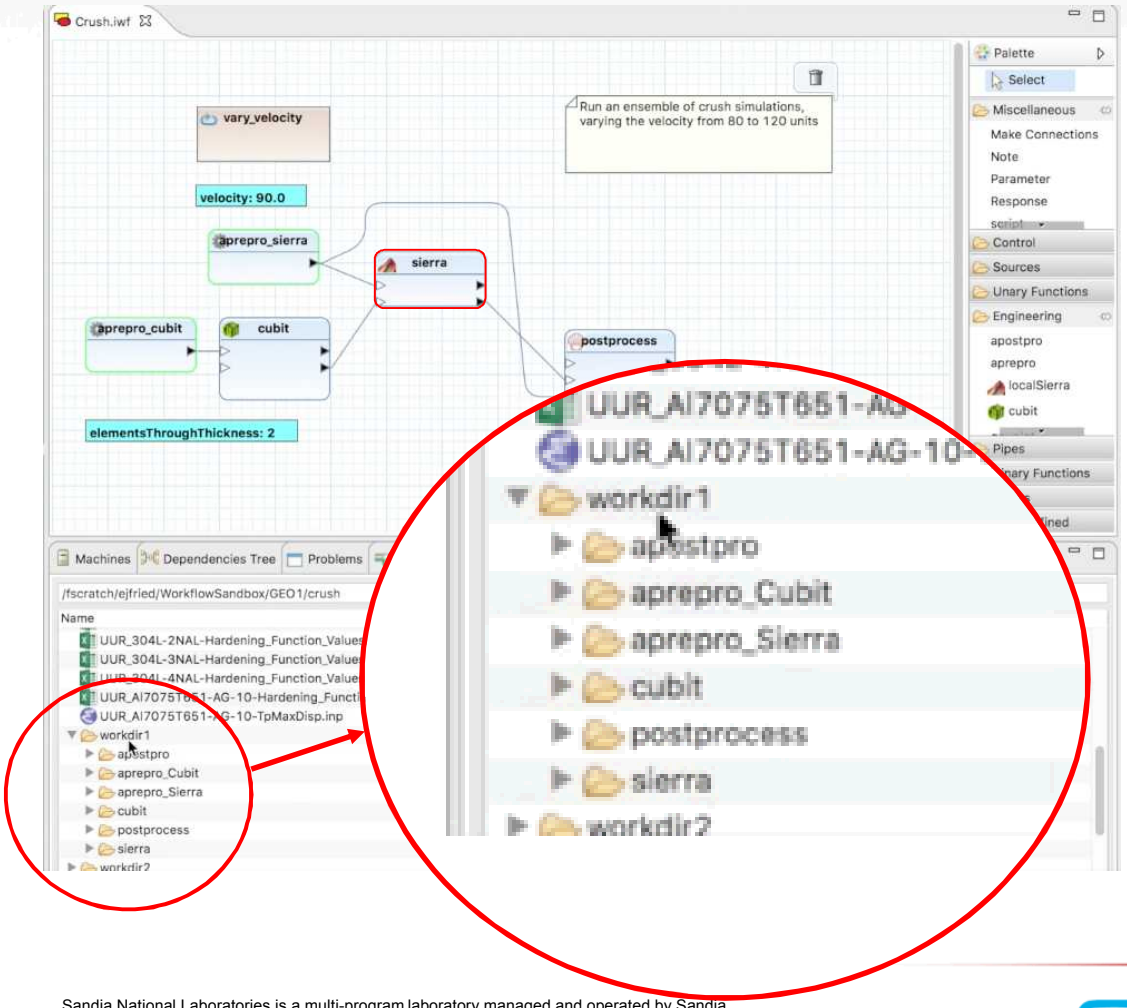
Job Monitoring and Distributed File Management

Workflow status reported graphically using standard views; clicking a workflow node opens its runtime data directory



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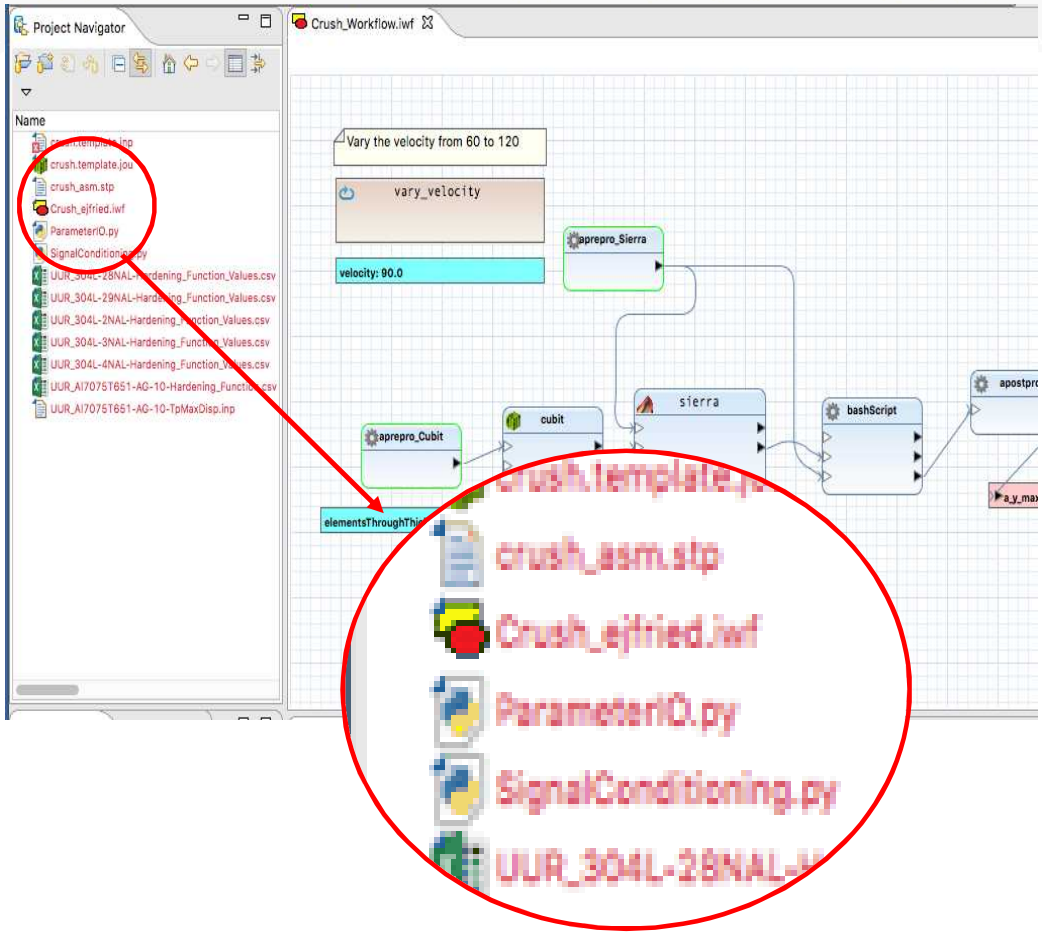
Scientific Data Management

A workflow is just a file, and it can be stored along with all the data it uses



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Benefits

- Reproducibility
  - It's easy to make sure you're performing the same steps
- Reliability
  - Errors handled robustly
- Reusability
  - No reinventing the wheel
- Team communication
  - Intrinsically documented processes

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- Matt Glickman
- Andrew Rothfuss
- Kevin Olson
- George Orient (V&V apps)

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Extra slides

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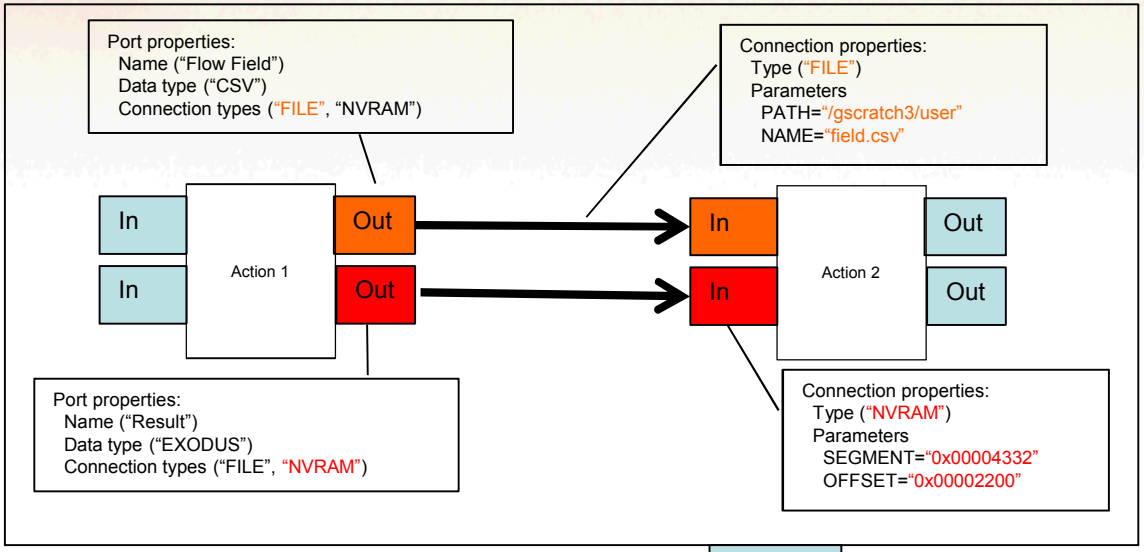
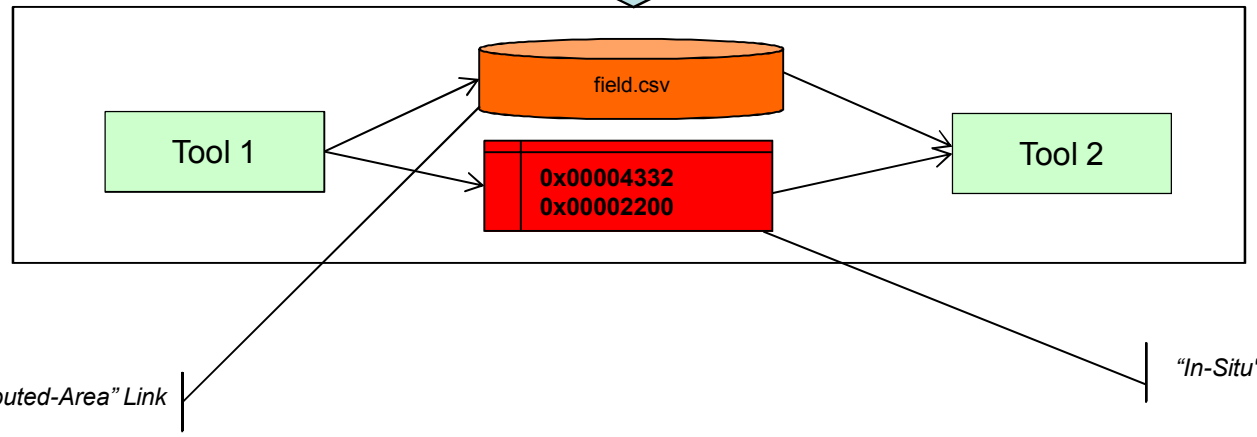
Final Scalable Workflow Architecture Directly Connects Actions Using Any Available Comms



Execute using COTS Workflow Engine



Descriptions of all inputs and outputs of workflow actions include available connection types. At runtime, in-situ connections are used as available. Result is distributed-area workflow containing embedded in-situ workflows.

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