



INTERNATIONAL CONFERENCE
Simulation Process & Data Management

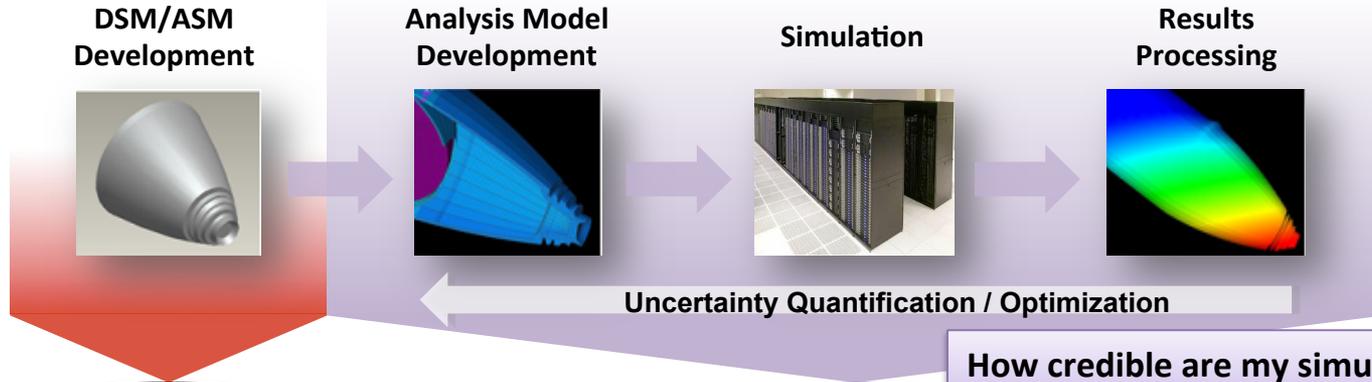
INCORPORATING WORKFLOW FOR V&V/UQ IN THE SANDIA ANALYSIS WORKBENCH

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SAIC

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Support the Design-To-Analysis process, capturing data in context

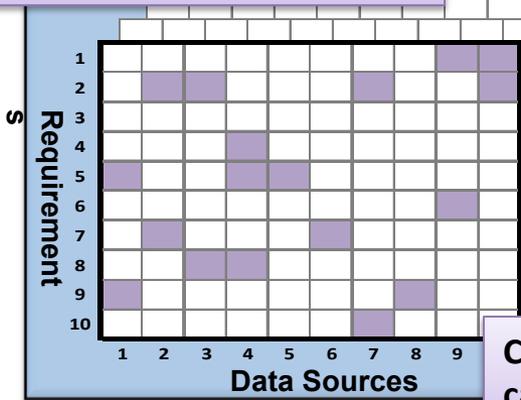


How credible are my simulations?

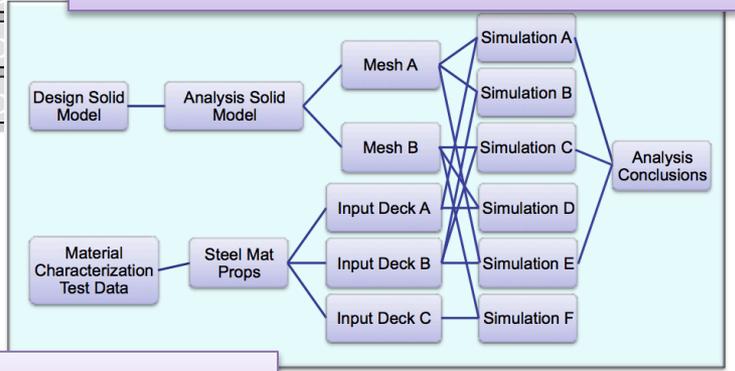


Do I understand the pedigree of my analysis data?

Can I support my engineering assertion?

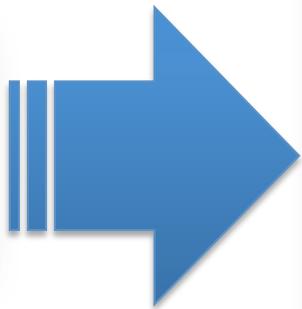
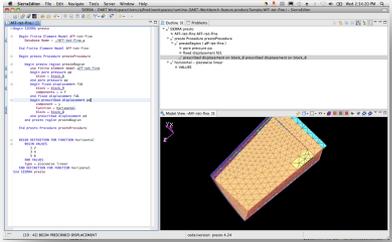
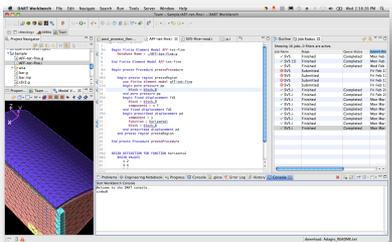
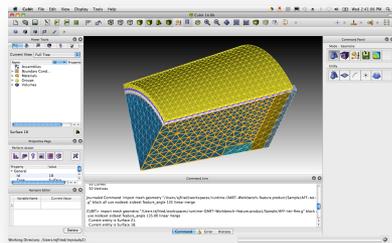


Can I re-execute models as computational capabilities continue to evolve?



SAW provides a unified view of distributed enterprise resources on the desktop

Multiple applications and tools combined into one, streamlining work and reducing complexity



The screenshot shows the SAW software interface with several panels:

- Project Navigator:** A tree view showing the project structure, including folders like 'Dakota-Milestone', 'ED_March_Training', and 'JoeDemo2'. Under 'JoeDemo2', there is a sub-folder '3_point_bend_test1' containing various files like 'beam3', 'cmcc1', 'displacement.txt', 'fetdpt.txt', 'gpm_functions.txt', 'gpm.txt', 'results_output.txt', 'solver.txt', 'testinp', 'v_reaction.bdf', and 'v_reaction.h'.
- Code Editor:** Displays the content of '3_point_bend_test1.g', showing a script with comments and function calls like 'begin property specification for material Default', 'begin parameters for model ELASTIC', and 'begin parameters for model elastic'.
- Outline/Job Status Table:** A table listing job submissions with columns for Name, Machine, Stage, Queue Status, and Submit Date.

Name	Machine	Stage	Queue Status	Submit Date
joint_model_SALINAS	shasta	Finished	Completed	Tue Nov 24 15:56:2
joint_model_SALINAS	shasta	Finished	Completed	Tue Nov 24 16:01:1
joint_model_SALINAS	shasta	Finished	Completed	Tue Nov 24 16:20:1
dt1b_blivet_060515	thunderbird	Finished	Completed	Tue Nov 24 16:37:1
joint_model_SALINAS	thunderbird	Finished	Completed	Wed Nov 25 12:09:2
Tall_assy	thunderbird	Finished	Completed	Wed Nov 25 12:25:4
Tall_assy	thunderbird	Finished	Completed	Mon Nov 26 19:36:3
- Model View:** A 3D visualization of a multi-colored (green, purple, blue) curved component.
- Team Members:** A list of team members including Marcus Gibson, Edward Hoffman, and John Green.
- Console/XY Plot:** A graph showing a red line representing a data series, with the x-axis ranging from 0.0 to 1.3 and the y-axis from -0.0007 to 0.0000.
- File Explorer:** A file list showing various files related to the '3_point_bend_test1' project, such as '3_point_bend_test1.g', '3_point_bend_test1.cfg', '3_point_bend_test1.g.4.0', etc.

SAW provides a unified view of distributed enterprise resources on the desktop

Simulation Data Management

Eclipse Workbench

Job Submission & Job Management

The screenshot displays the SAW software interface with several key components:

- Project Navigator:** A tree view on the left showing the project structure, including folders like 'DAKOTA-Milestone', 'Ed_March_Training', and 'JoeDemo2'. It lists files such as '3_point_bend_test1.i', 'beam.g', and 'cmcc.j'.
- Code Editor:** The central pane shows a script for '3_point_bend_test1.i' with comments and code for material properties and parameters.
- Job Status:** A table in the top right corner showing the status of various jobs.
- Model View:** A 3D visualization of a pen-like object, colored in green, purple, and blue.
- Team Members:** A table in the bottom left corner listing team members with their roles, emails, and names.
- Engine/Progress:** A line graph in the bottom center showing a decreasing trend over time.
- Distributed File Management:** A file browser in the bottom right corner showing a directory listing of files and folders.

Project Teaming

Model Assembly

Distributed File Management & Viz

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Parametric Analysis Workflow

- Automated process to execute and post process a single analysis – IT IS THE MODEL
- Driven by UQ/Optimization engine (DAKOTA at SNL)
 - **Efficiently**: leverage DAKOTA to manage concurrency
 - **Reliably**: resilient to random HPC (High Performance Computing) failures; report failure to UQ/Optimization engine for analysis instance retry
 - **Responsibly**: manage HPC utilization, manage disk space on file system; archive selected files after execution completes
 - **Platform independently**: environment fully parameterized
 - **Incrementally**: add post processing to existing design points as needed; evaluate QoIs and quantitative/qualitative credibility evidence
- **Required for UQ**
- **Supports analysis credibility evidence**
 - Documents all computational steps from input parameters to responses
 - Committed in repository

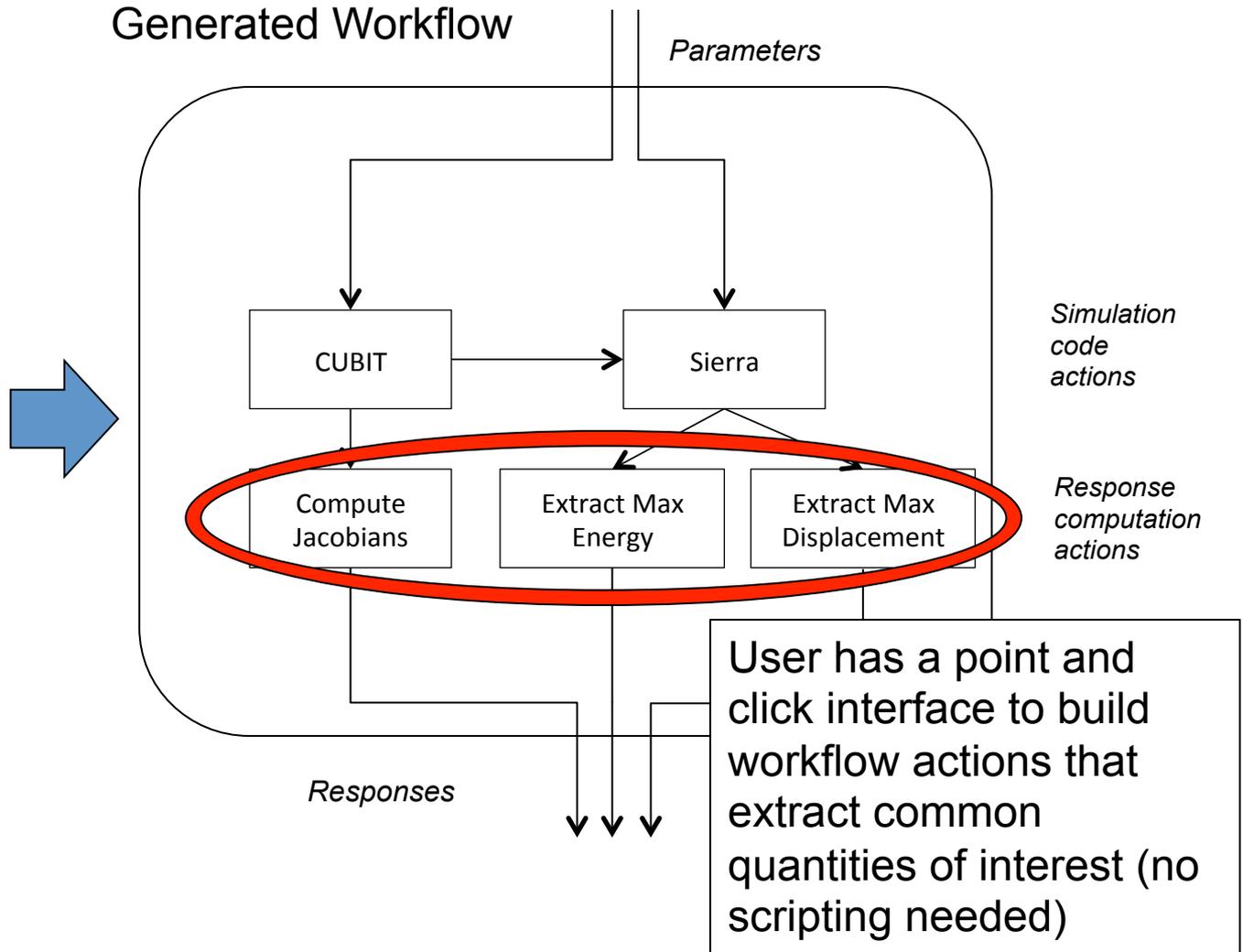
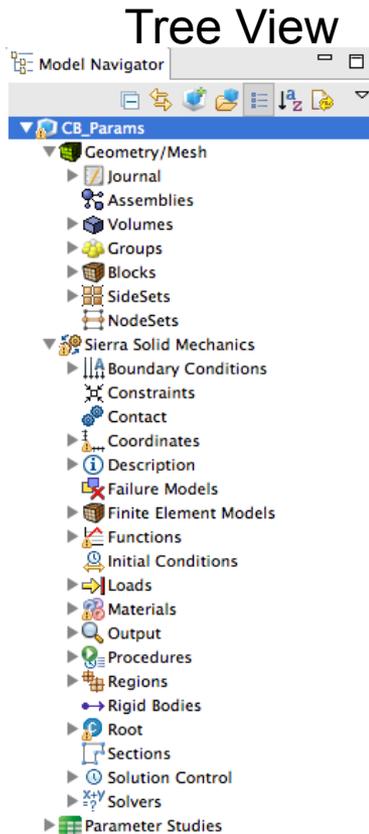
Open Source Workflow Platforms



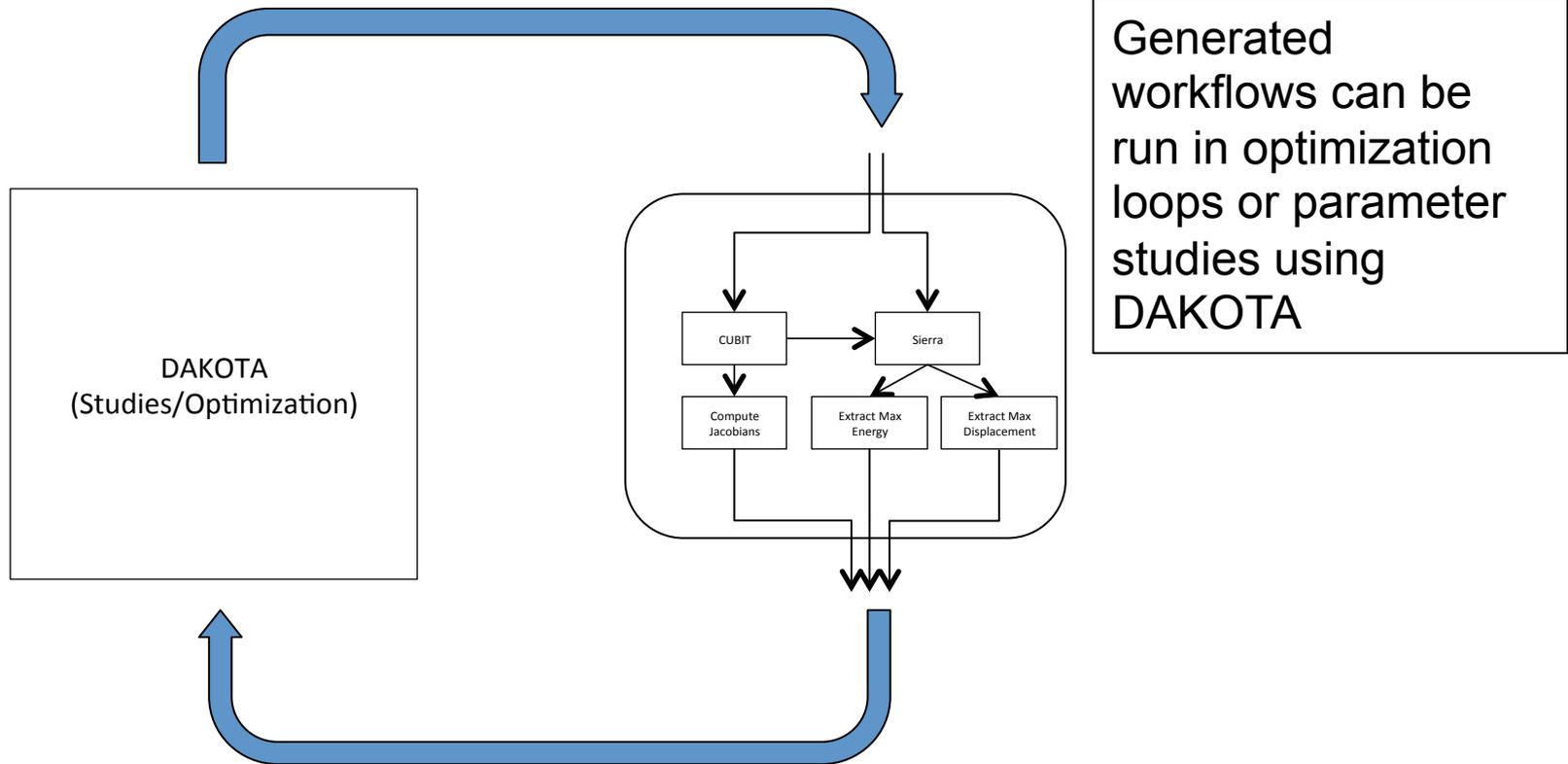
- UC Davis, Santa Barbara, San Diego; graphical model builder, execution engine, Linux, Windows.
- Apache Incubator project; Written in Java, graphical model builder, provenance tracking through OPM, remote web services, cloud/grid capabilities.
- USC; distributed resilient scheduling on heterogeneous computing (desktop, workstation, cloud), Linux, Mac.
- DAWN/Passerelle; modular/dynamic platform for process automation. Wraps Ptolemy II (UC Berkeley) open-source platform for actor-based modeling.

Challenge: Correct make/buy decisions based on long-term ubiquitous adoption and commitment for support; some assembly required!

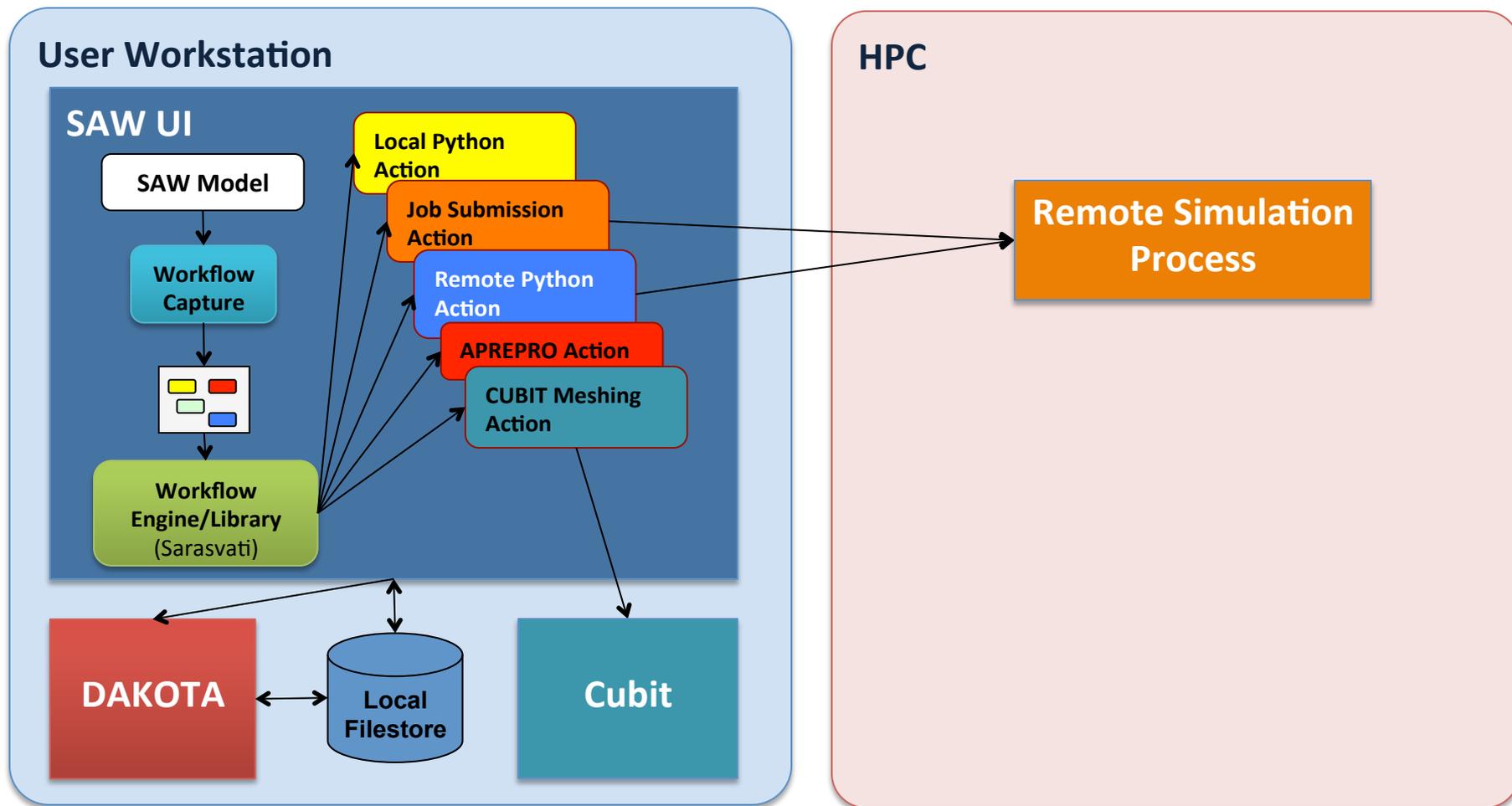
Current Status: Automatic Workflow Capture



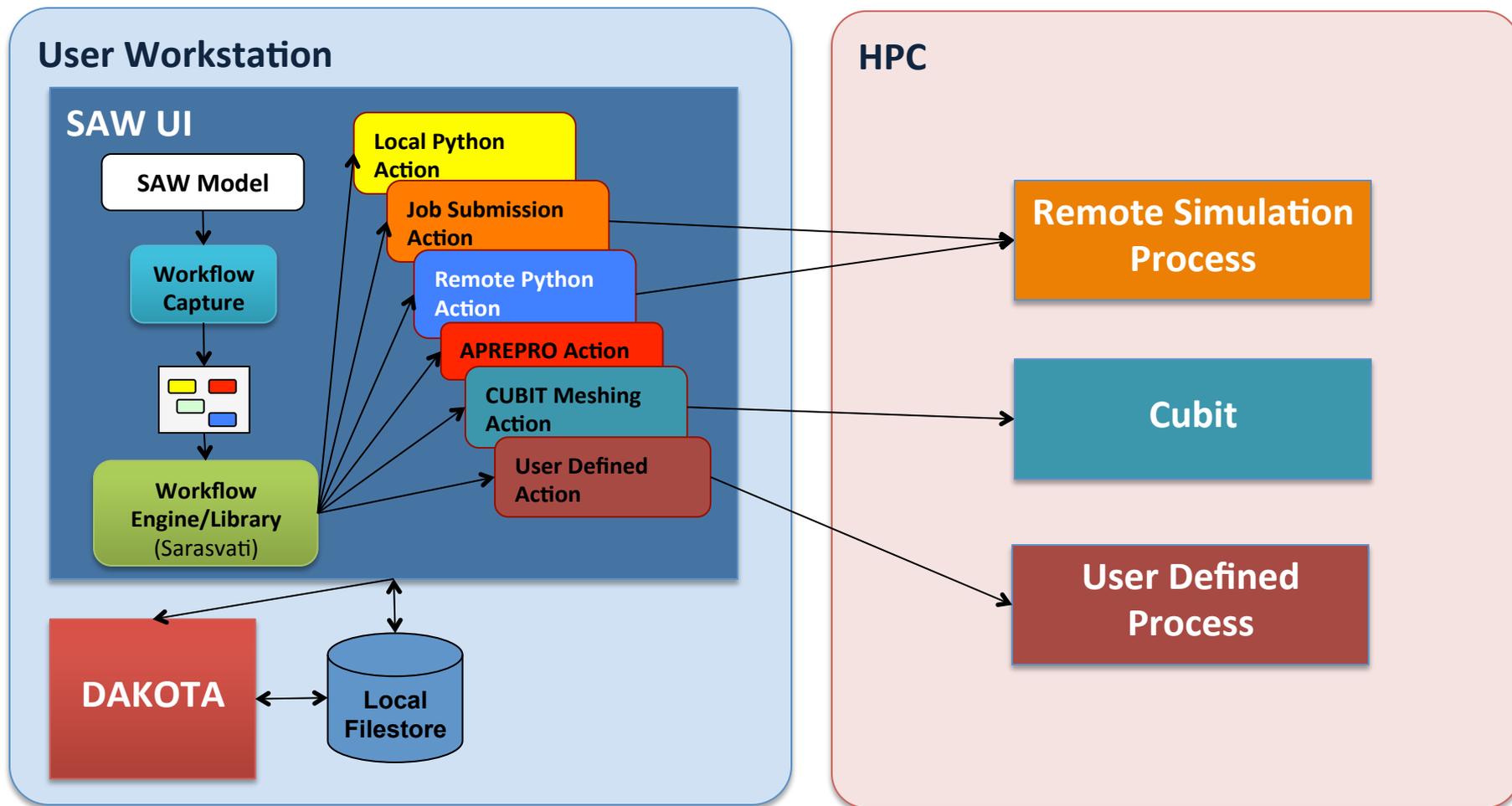
Current Status: Automatic Workflow Capture



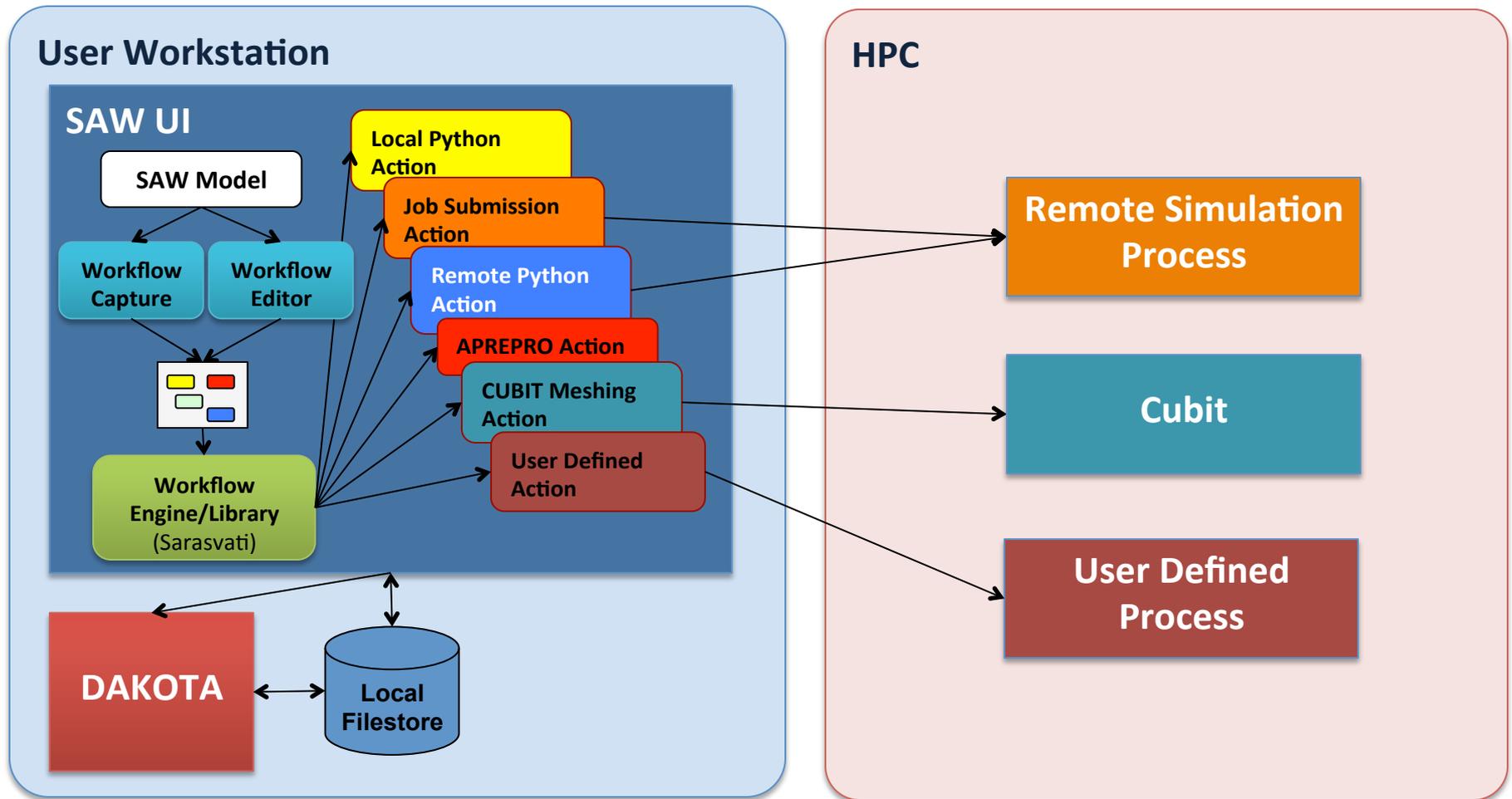
Workflow Architecture – Phase I



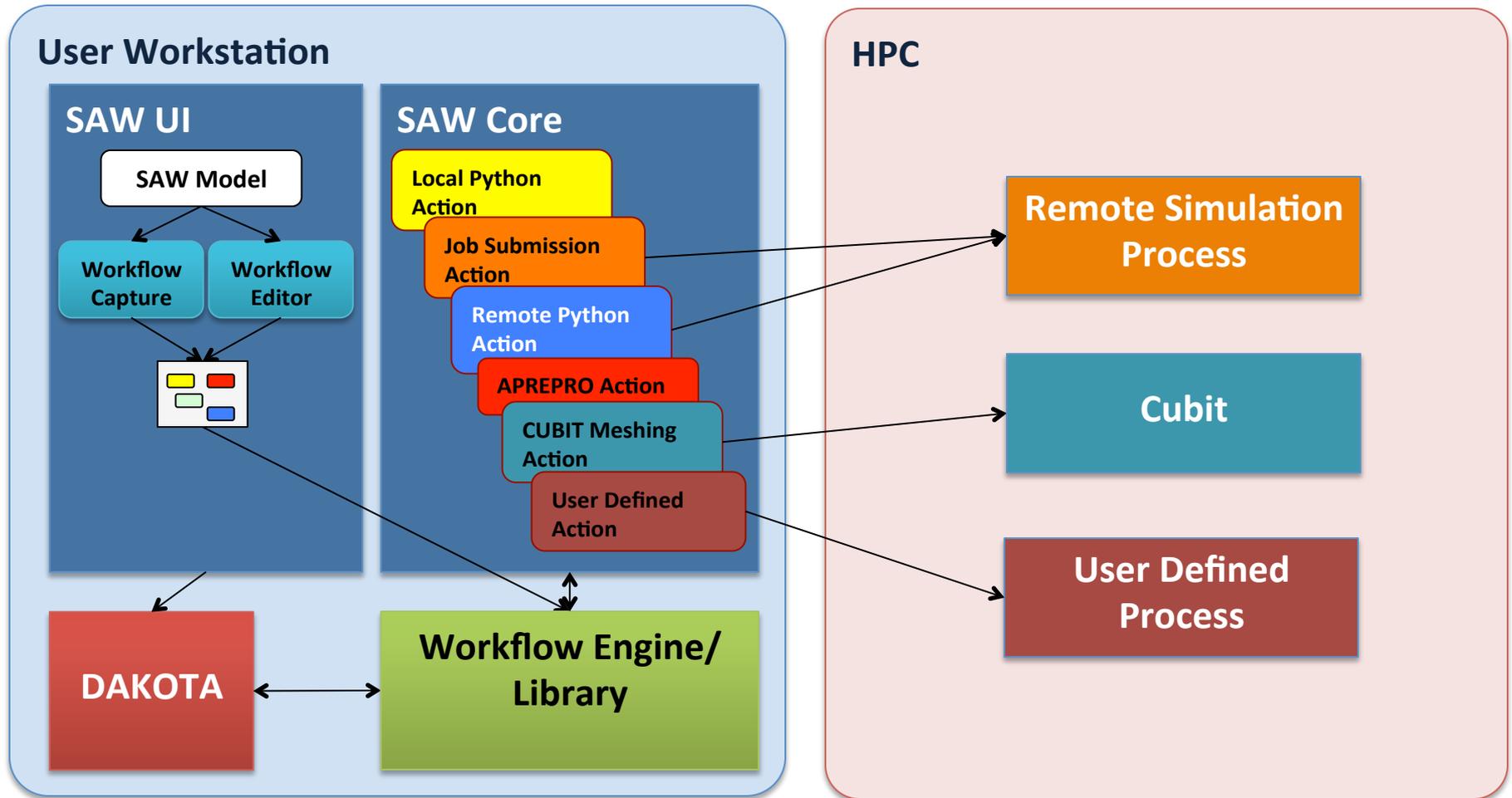
Workflow Architecture – Phase II



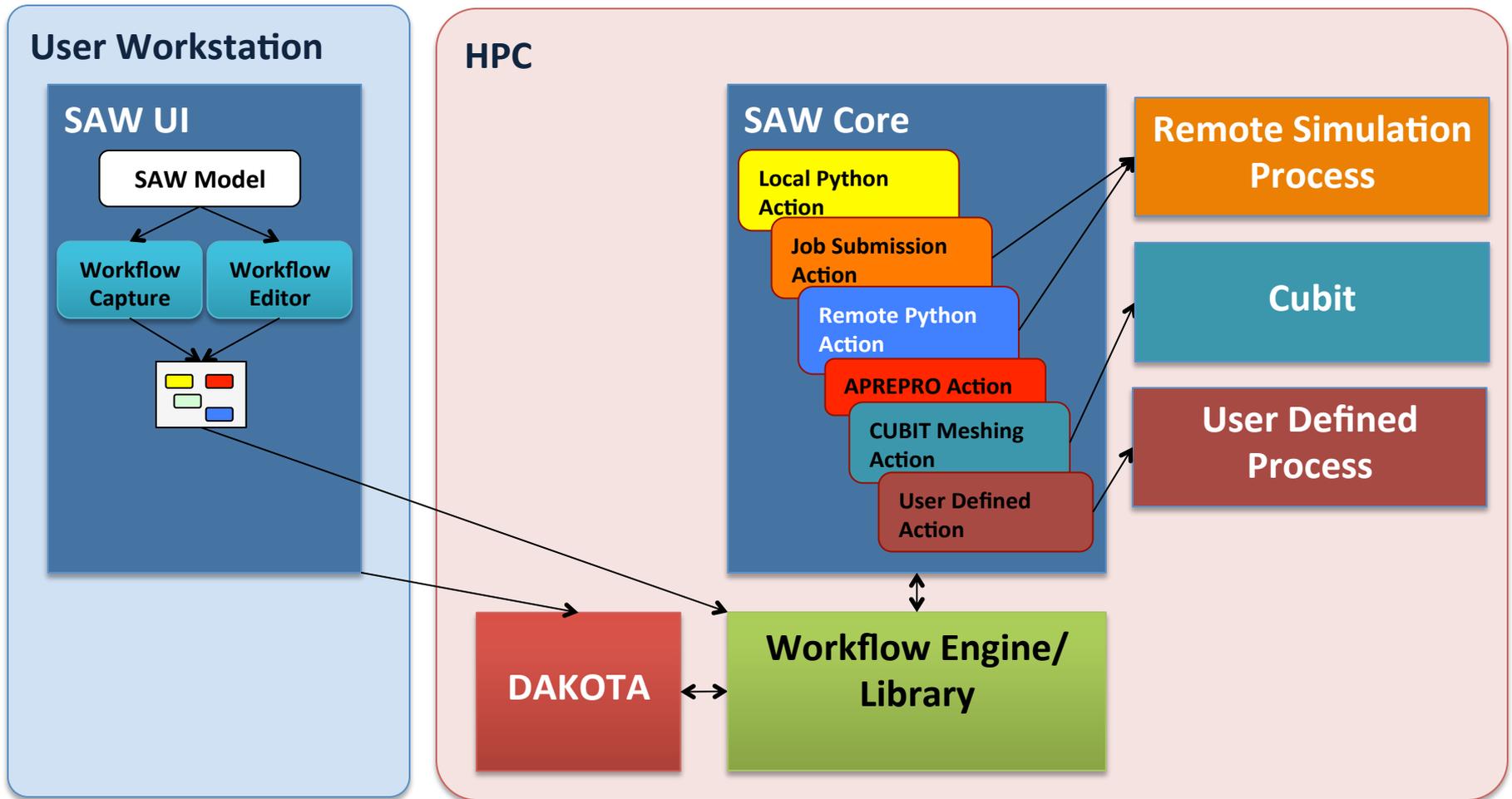
Workflow Architecture – Phase III



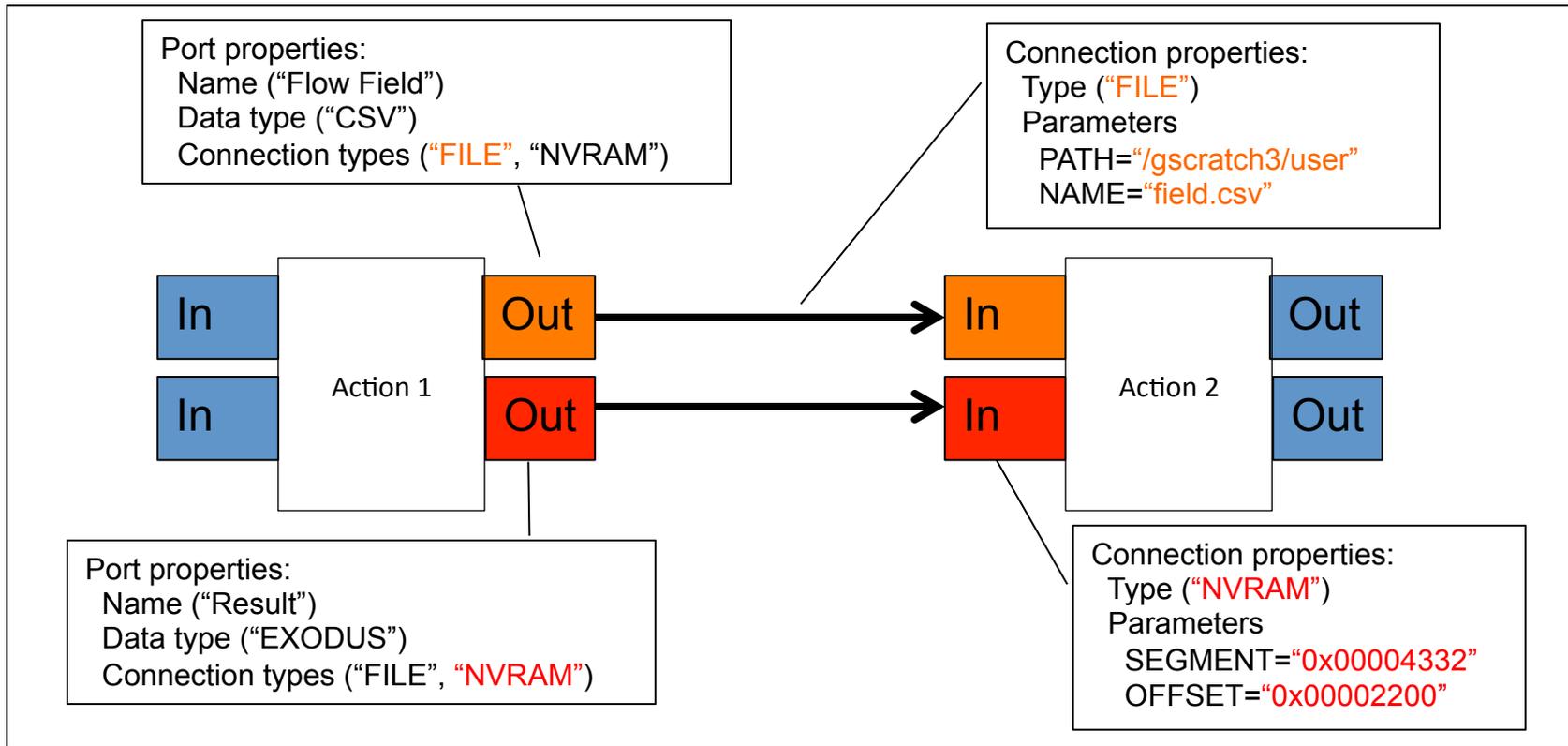
Workflow Architecture – Phase IV



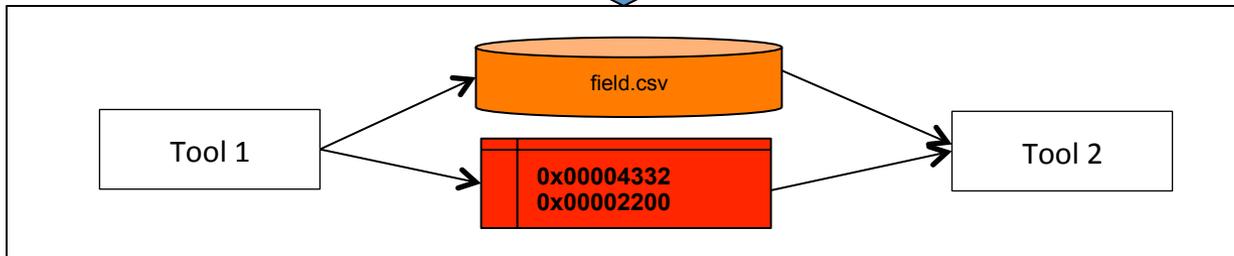
Workflow Architecture – Phase V



Proposed Scalable Workflow Architecture Directly Connects HPC Codes Using Available Comms



Execute using COTS Workflow Engine



Acknowledgements

- Ernest Friedman-Hill (PI)
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- Marcus Gibson
- Kevin Olson
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