Enabling V&V of Modeling & Simulation Workflows

Problem: SA/UQ studies are difficult to perform
- Requires significant scripting for workflow and response extraction
- DAKOTA is a powerful toolkit of methods for SA/UQ, but has a steep learning curve
- Overall model complexity increases

Solution: Lower the barriers to using DAKOTA by facilitating the setup and execution of sensitivity analyses from within SAW Model Builder
- Assist users in creating "DAKOTA Ready" models
  - Wrap SAW Model Builder in a workflow (Cubit → Sierra → Responses)
  - Model parameterization tools
  - Model Response Toolkit (MRT): extracting responses for common QOI
- Integrate DAKOTA problem definition into SAW Model Builder
- Create architecture for SAW to launch DAKOTA and for DAKOTA to execute SAW workflows

What is SAW Model Builder?
- Multiple tools combined into an integrated modeling environment
  - Geometry and meshing (Cubit)
  - Model Attribution (Sierra Editor)
  - Materials data management (formerly Materials WISDM)
  - Job submission
  - Simulation Data Management
  - V&V/UQ (DAKOTA)
- Model-centric, not file-centric
  - Unified model tree (geometry/mesh, physics, jobs, results, etc.)
  - Files are managed by SAW
- Interactive graphical model building
  - BC's, loads, materials, are applied directly to geometry
- Dashboard view of distributed resources

DAKOTA Ready Models

Automated Workflow Generation

Problem Setup & Execution

View Results

Providing insight into model sensitivities

Summary
- V&V/UQ is conceptually embedded in SAW Model Builder so users can focus more on exploring uncertainty than on running DAKOTA.
- The V&V/UQ capabilities in SAW make it possible to create and execute a DAKOTA study without writing complex scripts.
- Initial implementation focused on Cubit/Sierra workflow, but the SAW/DAKOTA architecture supports any workflow (e.g. XYCE).