FRAMES 2.X—Science to Solutions Multimodel Operating System

Pacific Northwest National Laboratory

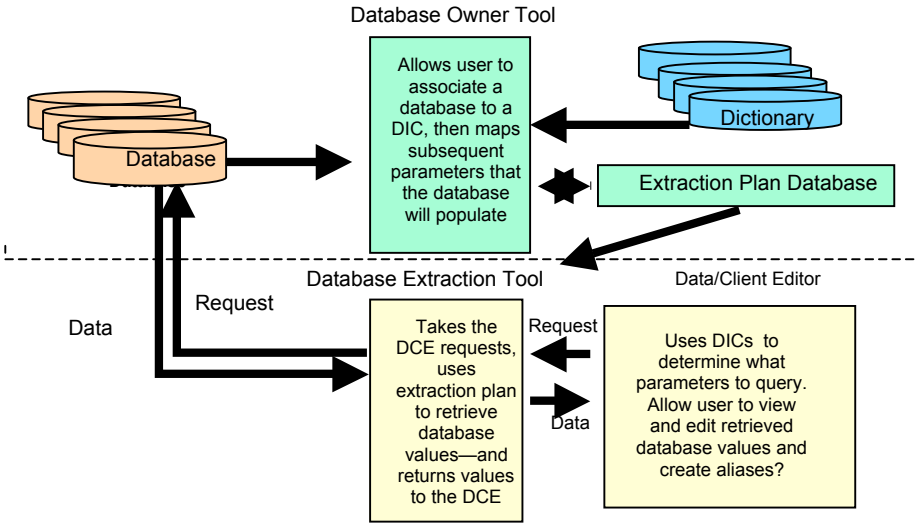
FRAMES 2.x features quality from the inside out. Automated testing, streamlined coding, and online documentation make this multiple-model operating system easy to use and reliable.

Today's complex problems require analysts to expand their modeling environment. Analyses, ranging from financial to environmental, require a flexible system for new and older (legacy) models that produce results to support informed decision-making.

FRAMES 2.x is a flexible, multiple-model operating system that capitalizes on a user's existing models and tools. It features tools to incorporate models that integrate across scientific disciplines, allowing for tailored solutions to specific activities. It also provides a mechanism to relay meaningful information to business and technical managers, allowing analysts to expand modeling options across disciplines and into related market areas.

A Wide Range of Tools for a Wide Range of Applications

FRAMES includes tools to assist model developers as well as analysts. **Decision analysis** tools visualize results and analyze sensitivity and uncertainty. **Data management** tools enable a database owner to fully understand the analyst's needs and then map database schema and develop extraction plans. Analysts use these plans to run models faster.



Model interaction tools allow users to build or import dictionaries of data, define units, build or import modules, set up domains, and define connection schemes. To help module developers integrate models into FRAMES, the system comes with the following:

- **(Units) Conversion Editor** – Choose from a set of existing units or add new ones
- **Dictionary Editor** – Learn the formatting and content necessary for a well-formed dictionary specification
- **Domain Editor** – Design or enhance a set of module options and create or edit multiple domains to meet specific needs
- **Module (Description File) Editor** – Create the module file, including linkage schemes, executable names, and references, to allow a model to function within FRAMES

For More Information Contact:

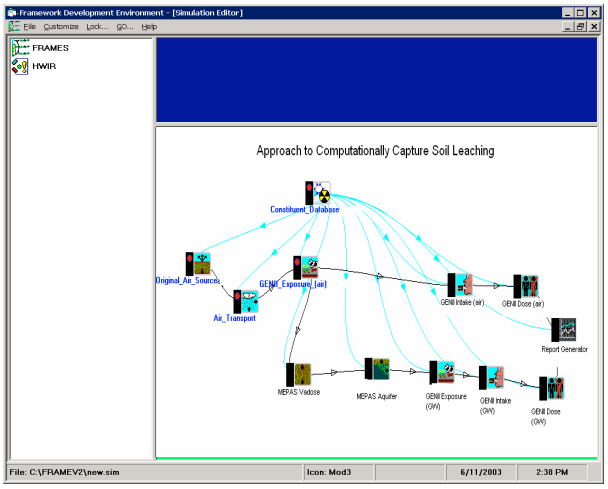
http://mepas.pnl.gov/FRAMESV1/

Karl Castleton
Pacific Northwest National Laboratory
c/o Mesa State College
Computer Science, Math & Statistics
1100 North Ave
Grand Junction, CO 81501
(970) 248-1837
Karl.Castleton@pnl.gov

or

Gariann Gelston
Pacific Northwest National Laboratory
P.O. Box 999, K7-97
Richland, WA 99352
(509) 372-6060
Gariann.Gelston@pnl.gov

PNNL-SA-39446 (09/03)



- Define the environment as real-world objects
- Visualize or tabularize results
- Allow for re-analysis.

- **Dataset Editor** – Populate datasets to test that the module fully functions in the system before deploying it with other modules.

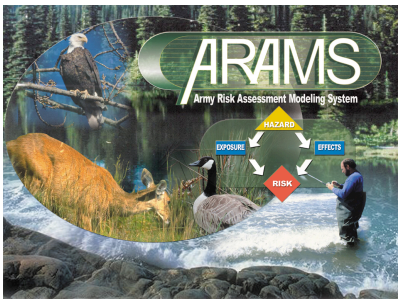
A **User Interface** pulls together the suite of tools, allowing users to select domains and modules, connect modules, select models and databases, run extraction plans, populate and run models, conduct sensitivity and uncertainty analysis, and optimize capabilities. This interface provides a mechanism to:

- Conceptualize and define the problem by dragging and dropping
- Easily link models, databases, and frameworks together in a plug-and-play environment (for both new and legacy models)
- Perform sensitivity and uncertainty analyses

How Decision Makers Are Using FRAMES

The U.S. Environmental Protection Agency used FRAMES concepts as part of its **Multimedia, Multipathway, and Multireceptor Assessment Strategy** for its Hazardous Waste Identification Rule (October 1999). This forward-calculating analysis evaluated multiple exposure pathways and risks to human and ecological receptors. Starting with a chemical concentration in a waste management unit, the analysis estimated chemical release and transport in various environmental media and predicted the exposure and risk resulting from those concentrations. The probabilistic approach estimated risk on a national scale. The assessment could follow several different analytical levels depending on available resources and the amount and quality of available data. A full set of system documentation can be found at http://www.epa.gov/epaoswer/hazwaste/id/hwirwste/risk.htm.

The U.S. Department of Defense and the Army conduct risk assessments to determine cleanup target levels for military relevant compounds and to evaluate remediation alternatives to provide the most cost-effective approach to reach target levels. The U.S. Army Engineer Research and Development Center is developing a computer-based, modeling, and database-driven analysis system to estimate human and ecological health impacts and risks associated with these compounds. FRAMES serves as a component of the **Army Risk Assessment Modeling System** (ARAMS). For more information, see the U.S. Department of Defense website at http://www.wes.army.mil/el/arams/devapp.html.



The principles of FRAMES were applied for the American Chemistry Council to conduct gap analysis to guide future research. The analysis resulted in the design for the **Comprehensive Chemical Exposure Framework**, which provides the following:

- An interface to visualize problems
- A mechanism to link more sophisticated, science-support models when needed to explore more accurate and mechanistically based cumulative and aggregate exposures and effects
- Remote access of databases and models
- Sensitivity/uncertainty analyses and parameter estimation
- Linkages to Geographic Information Systems
- Backward compatibility with legacy codes
- Linkages to and utilization of other modeling frameworks (e.g., fate and transport and micro-environmental models).

The Interagency Steering Committee on Multimedia Environmental Models is committed to develop the next generation of multiple model operating systems, which are consistent with the principles of FRAMES. For more information, see http://www.iscmem.org/Proceedings.htm.