2005 RELAP5 International Users Seminar

RELAP5-3D /MOD3.3 Merger

Code Merger Process
Jim Wolf  INL

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Background

• Prior to 1996 the INL was the sole developer of the RELAP series of codes
• In 1996 RELAP5 split into two separate codes
  – RELAP5/MOD3.3 continued to be developed by the NRC through SCIENTECH (1996-2000) and Information Systems Laboratories (ISL)
  – RELAP5-3D development by DOE was initiated through the Idaho National Laboratory (INL)
• Different development paths were required to address the different operational directions of the sponsoring organization
Background (Cont.)

• In 2004, discussions started which were aimed at merging the two different codes back into a single RELAP.

• Government is currently reviewing formal recommendations to merge the two versions of RELAP5

• Benefits of a merged code
  – Merging the codes would result in all available resources for RELAP development and maintenance focused on a single product
  – A larger cadre of experienced developers would be available both now and in the future
  – A single reactor safety design and analysis code, more advanced than either of the other two alone, would be available to all users
RELAP5 Merger

- Objective of merger: Have a single code that will possess improved capabilities when compared to the existing individual RELAP5 codes
- The concept of a merged code has the full support of DOE-NE and NRC
- Formal agreements (MOUs) for this effort will be entered into by the sponsoring agencies
- Management Plans will be developed by INL and ISL prior to start of merger activities
Merger Process

• Working as agents for DOE and NRC, INL and ISL will jointly perform the merger activities
• Architectural advancements (Fortran 90, parallel architecture, 64 bit integer and memory management) in the RELAP5-3D require that it be the base code.
• The merger will consist of moving selected coding, logic, models and features from the RELAP5/MOD3.3 code into the RELAP5-3D code
  – Selection based on the improvement over like models currently in RELAP5-3D
  – New capability not in RELAP5-3D
  – Retain full capability of both codes
Test Cases

• A library of test cases will be assembled for use in testing the code as models and features are introduced. These cases will be drawn from the following sources:
  – “Legacy” input decks submitted by stakeholders (Bettis, IRUG, CAMP, DOE, and NRC) for assurance of preserved fidelity in the post-merger code
  – Selected developmental assessment input decks and data from INL and ISL libraries
  – Selected installation input decks from INL and ISL
  – Selected model-specific test input decks from INL and ISL
Test Cases (cont)

• Subset of test cases, called Level I will be selected
  – Cases will be run for every new model or feature added or changed in the merged code
  – Criteria for selection will be their ability to test a broad spectrum of models in the code, especially those changes being introduced into the merged code that are considered “pervasive

• Level II test cases will be identified on the basis of their ability to test specific model changes made during the merger.
  – Introducing improvements in the offtake model made in MOD3.3 would only require testing with a very few test cases that invoke this model
Merger Completion

• Successful merger will be defined by acceptance testing of the merged code using pre-defined metrics and a library of test and validation cases derived from the two separate codes.

• Successful merger will mean that input decks used by IRUG and CAMP members can be easily adapted to the merged RELAP code.
Merged Code

- INL will serve as the Code Custodian and ISL will manage user interactions.
- Supported Platforms for the merged code will be Linux, Windows, and Unix for the Sun.
- Other codes (TRACE) that can currently read a MOD 3.3 input deck will still be able to read a merged code MOD 3.3 deck. This will not be the case for decks that incorporate 3D geometry.
- Users may access any of the available codes (TRACE, RELAP5-3D, RELAP5/MOD 3.3, and the merged RELAP code) through the SNAP interface.
Technical Issues

- Determine exact list of RELAP5/MOD 3.3 models and features to be included in merged code
- Features that are in RELAP5-3D that are not in MOD 3.3
- Code performance metrics
- Configuration control method such as CVS
- Compiler and debugger
- User interface upgrades
Technical Issues (cont)

• Development guidelines
  – Procedure for submitting code updates
  – Format Coding practices
  – Style for source code and input files

• Pre and post processors

• 64/32 bit integers

• Consolidation of all applicable Manuals
RELAP5 Merger Schedule

- Details will be developed by October 2005 as part of the joint ISL/INL Management Plan
- Manpower resources and workscope will be divided between INL and ISL in a manner that most effectively uses available resources
- Code merger project completed by end of 2008
- Final Developmental Assessment will be performed by code user organizations such as INL, ISL, CAMP, IRUG
- After completion of the final DA, a new Validation Report (currently Vol. III of the RELAP manuals) will be developed, issued, and maintained current for the Merged RELAP code.
Summary

• Merger activities performed jointly by ISL and INL staff
• Extensive library of test cases will be assembled to insure merged code performance
• Single code that has combined capability of the separate codes