2005 RELAP5 International
Users Seminar

RELAP5-3D /MOD3.3 Merger

Code Merger Process

Jim Wolf INL

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Idaho National Laboratory

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**