Extension of the SNAP Model Editor to Support the RELAP5-3D© Code

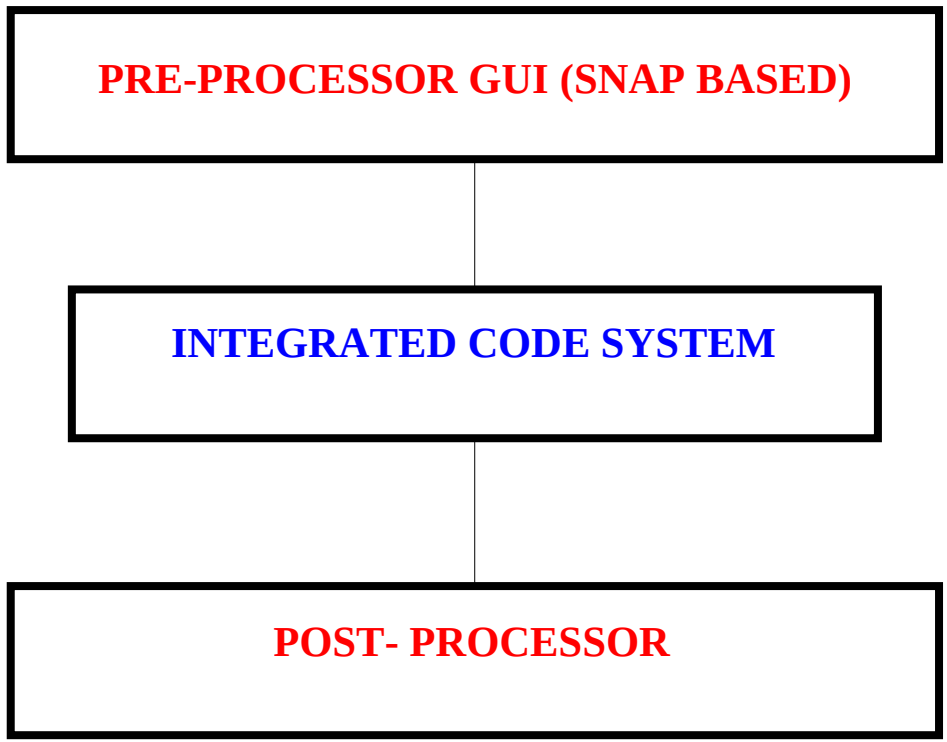
August 27-29, 2003

INFORMATION SYSTEMS LABORATORIES, INC.
11140 Rockville Pike, Suite 500
Rockville, MD 20852
(301) 468-6425 Fax: (301) 468-0883

Design Objectives

- Provide a wrap-around common engineering interface to multiple analysis codes.
- Provide a graphical view of the flow, heat and logic model network.
- Share design information from a common, controlled database.
- Provide user-friendly tools and wizards and perform on-the-fly renodalization.
- Improve consistency and quality assurance.

Wrap-around Common Engineering Environment



Background

- Initial funding from the NRC to support
  - RELAP5 Mod3.3
  - TRACE (formerly TRAC-M)
- Included hydraulics, heat structures, control systems and point kinetics
- Cross-platform design
  - first written in C++ with toolkits
  - later rewritten using Java1.2
  - now Java1.4 compliant

Extensions for RELAP5-3D

- Modeling Options
  - development options
  - print control
- Multi-dimension Component
  - based on work done for the TRACE vessel
  - Cylindrical and Cartesian geometries
- Pressurizer Component
- Parametric variable names

Nodal Kinetics

- Cartesian and hexagonal geometries
- Zone and composition assignments are displayed using mesh tables.
- Supported Feedback types
  - RAMONA
  - HWR
  - GEN

Component Object Model

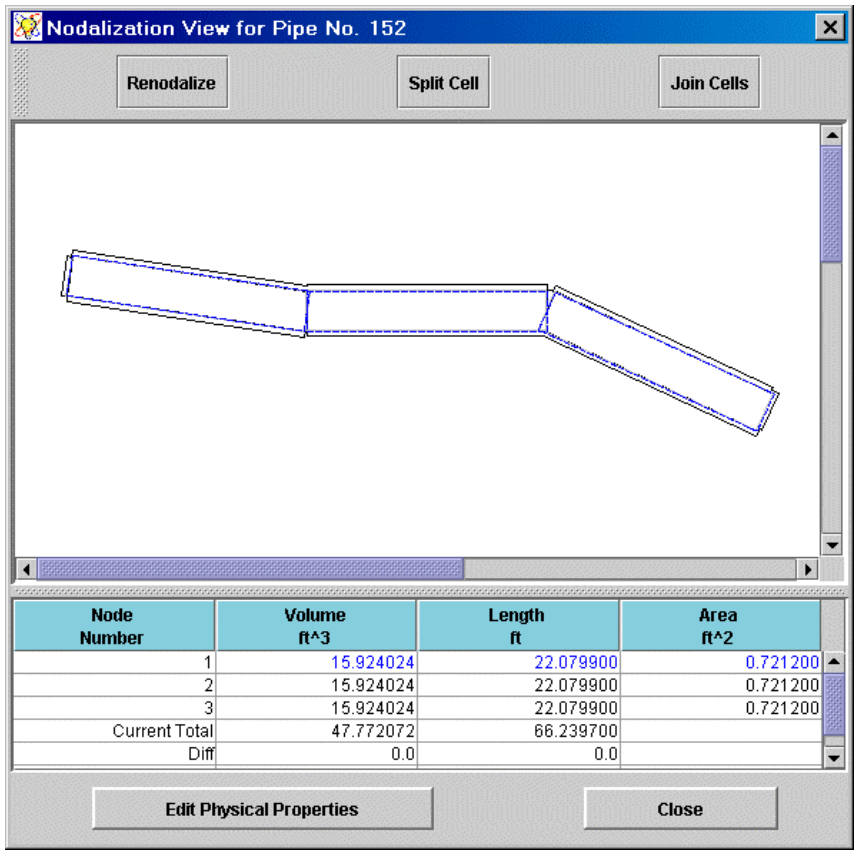
Physical data is entered which can then be divided into the calculation mesh.

- Containers
  - Volumes
  - Heat Slabs
  - Control Blocks
- Links
  - junctions
  - logic flow

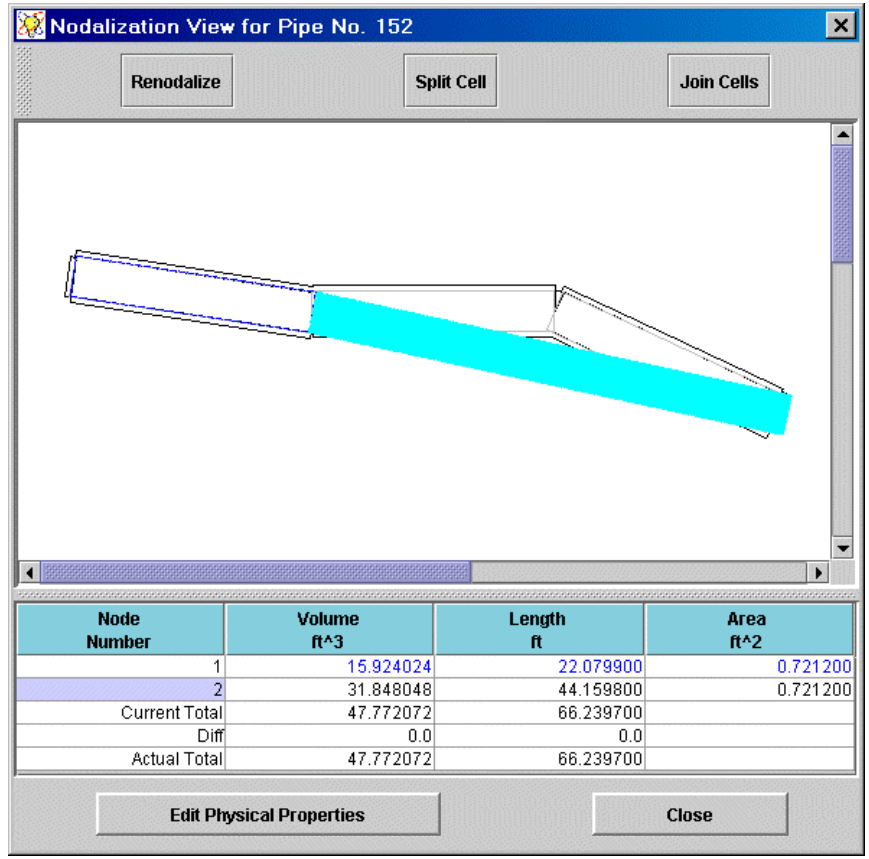
Code to Code Translation

- Geometry based on “metadata” representation
  - first extract the physical data
  - then create new code specific objects
- Model options are based (as much as possible) on physical properties and user preferences. Remainder will be supplied through user interaction.

Renodalization

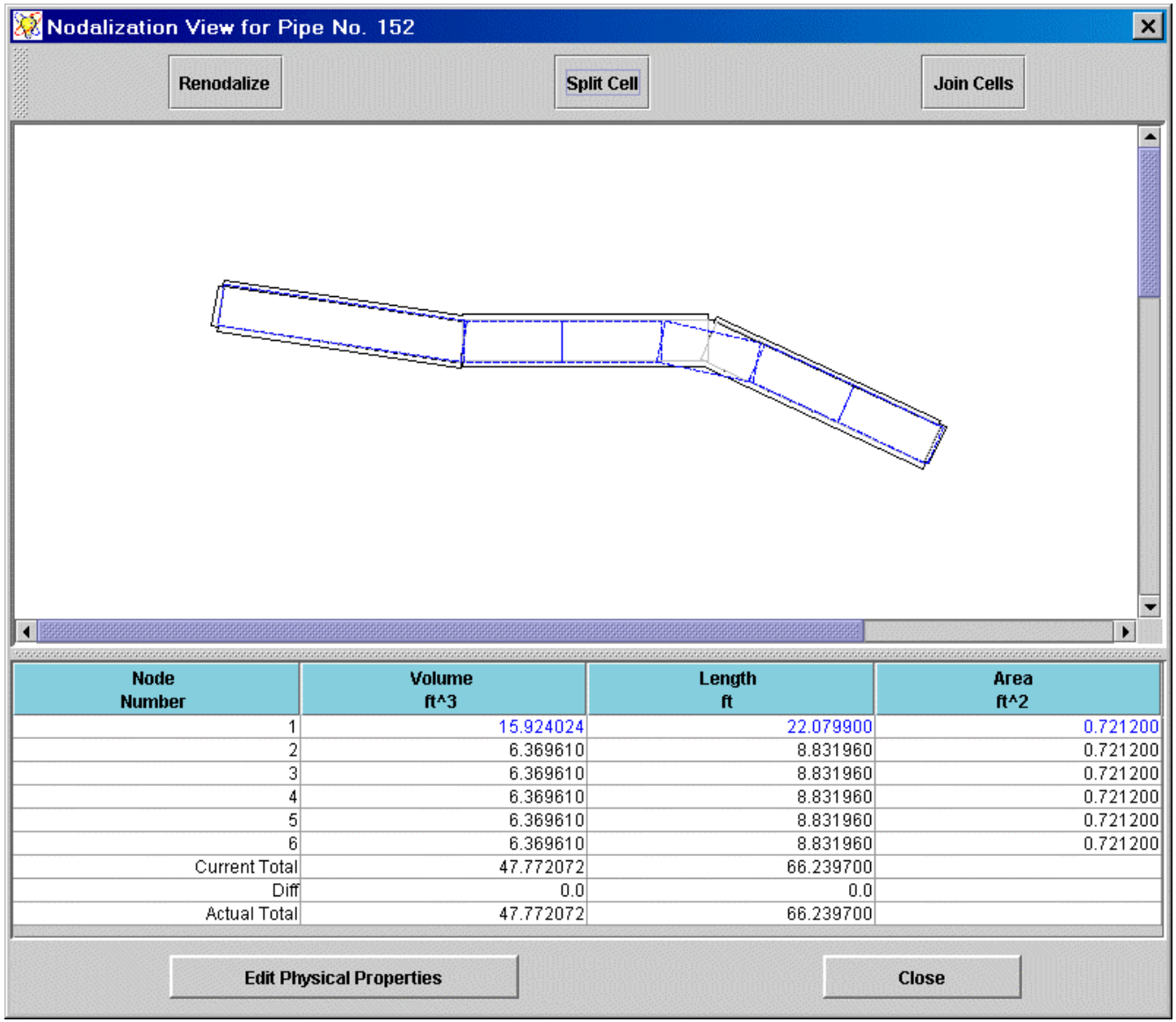


Node Number	Volume ft^3	Length ft	Area ft^2
1	15.924024	22.079900	0.721200
2	15.924024	22.079900	0.721200
3	15.924024	22.079900	0.721200
Current Total	47.772072	66.239700	
Diff	0.0	0.0	



Node Number	Volume ft^3	Length ft	Area ft^2
1	15.924024	22.079900	0.721200
2	31.848048	44.159800	0.721200
Current Total	47.772072	66.239700	
Diff	0.0	0.0	
Actual Total	47.772072	66.239700	

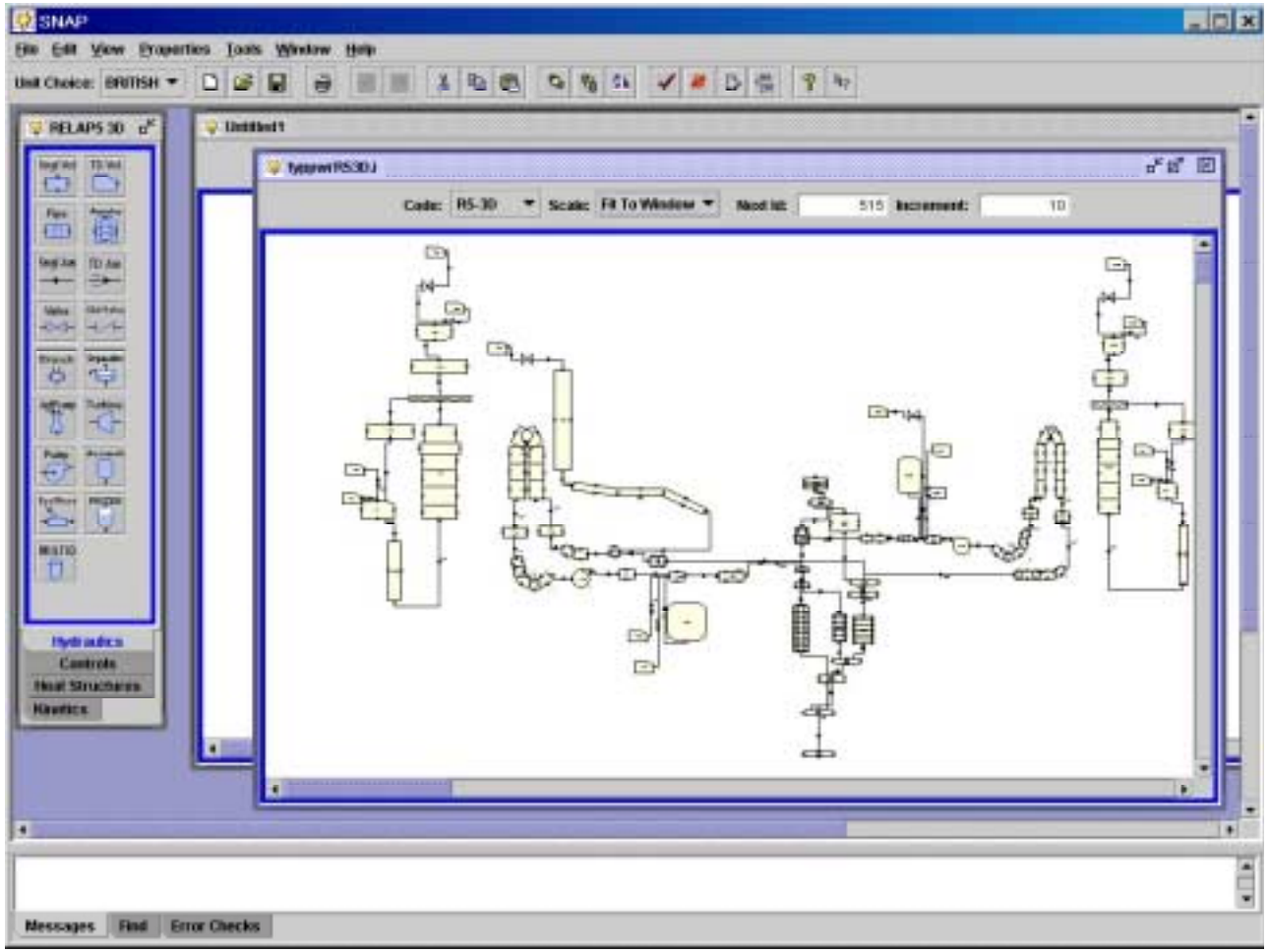
Renodalization Cont.



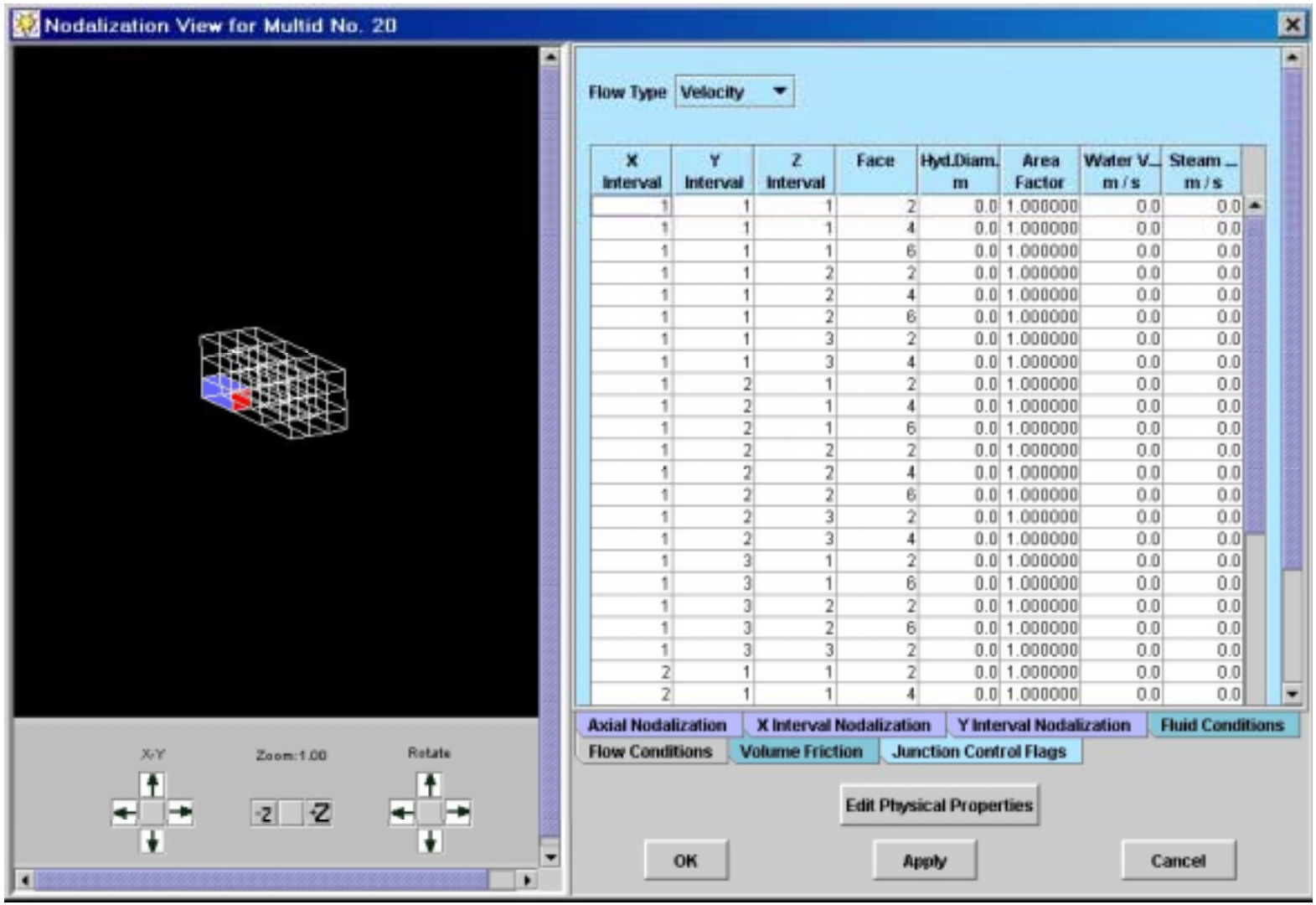
Node Number	Volume ft^3	Length ft	Area ft^2
1	15.924024	22.079900	0.721200
2	6.369610	8.831960	0.721200
3	6.369610	8.831960	0.721200
4	6.369610	8.831960	0.721200
5	6.369610	8.831960	0.721200
6	6.369610	8.831960	0.721200
Current Total	47.772072	66.239700	
Diff	0.0	0.0	
Actual Total	47.772072	66.239700	

User Interface Design

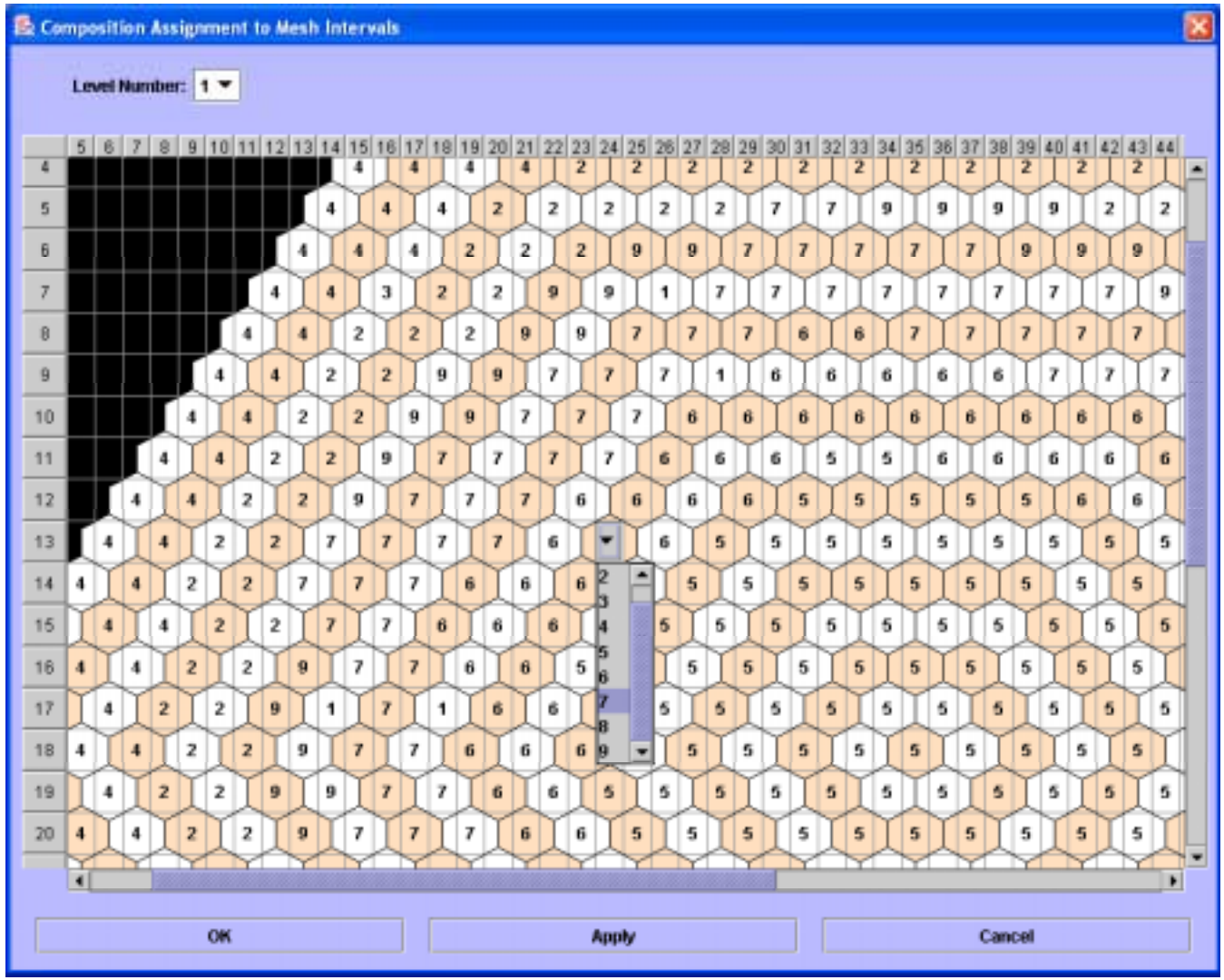
Model Editor Main Window (typpwr model shown)



Multi-dimension Component



Nodal Kinetics



Work In Progress

- Component Grouping
  - simplify the display be allowing sets of components to be grouped as a composite
  - does not change any physical data
- Intelligent Renodalization Wizard
  - Current code can only divide 1 or more cells in a pipe into equal area cells.
  - New procedure acts on a set of connected components or the whole model.
  - Uses experience-based rules.

Conclusion

- Flexible and extensible architecture
- Provides visual representation of complex input models
- Automate repetitive tasks
  - Consistent with engineering guidelines
  - Decrease user effects