Regional Summit 2008 NAFEMS

2020 Vision of Engineering Analysis and Simulation

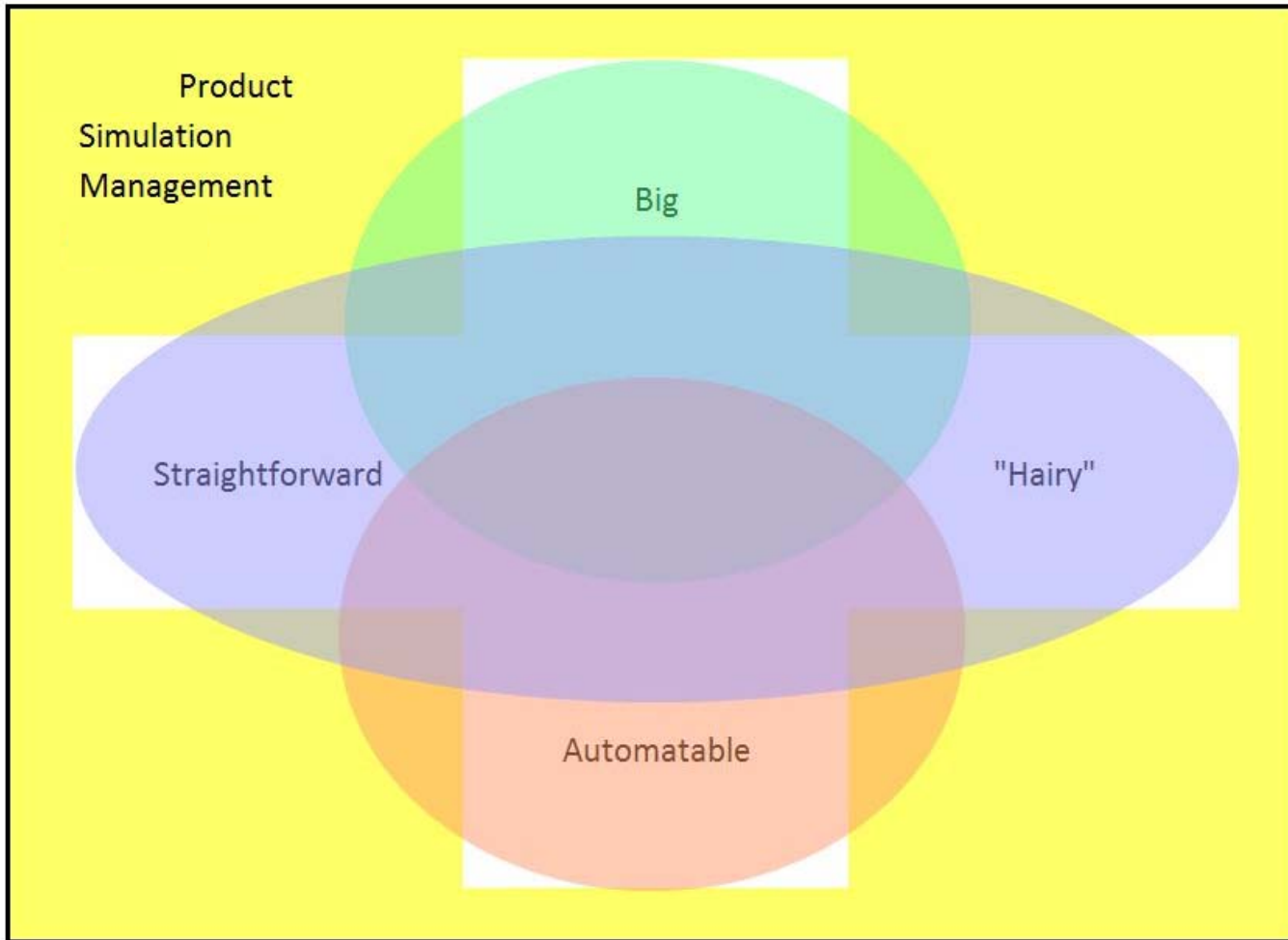October 29 - 31, 2008 | Hampton, Virginia

MCAE OPPORTUNITIES AND MARKETS: A FRESH LOOK

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MCAE Market Map

Our Question

- **How can MCAE be used to drive decisions in a timely way?**

- How can we break down the market to find an answer to this question?
  - Nature of questions: Straightforward to "hairy"
  - Scale
  - Layer of automation that can be overlaid
  - All on a platform of data management

Who We Asked

- Customers
- Vendors
- Consultants

Assumptions

- Market size: $2B
- Useful differentiators: Problem types
  - Scale
  - Difficulty
  - Workflow
- Useful differentiators: Customer types
  - Specialists
  - Generalists
- Useful differentiators: Customer organizations
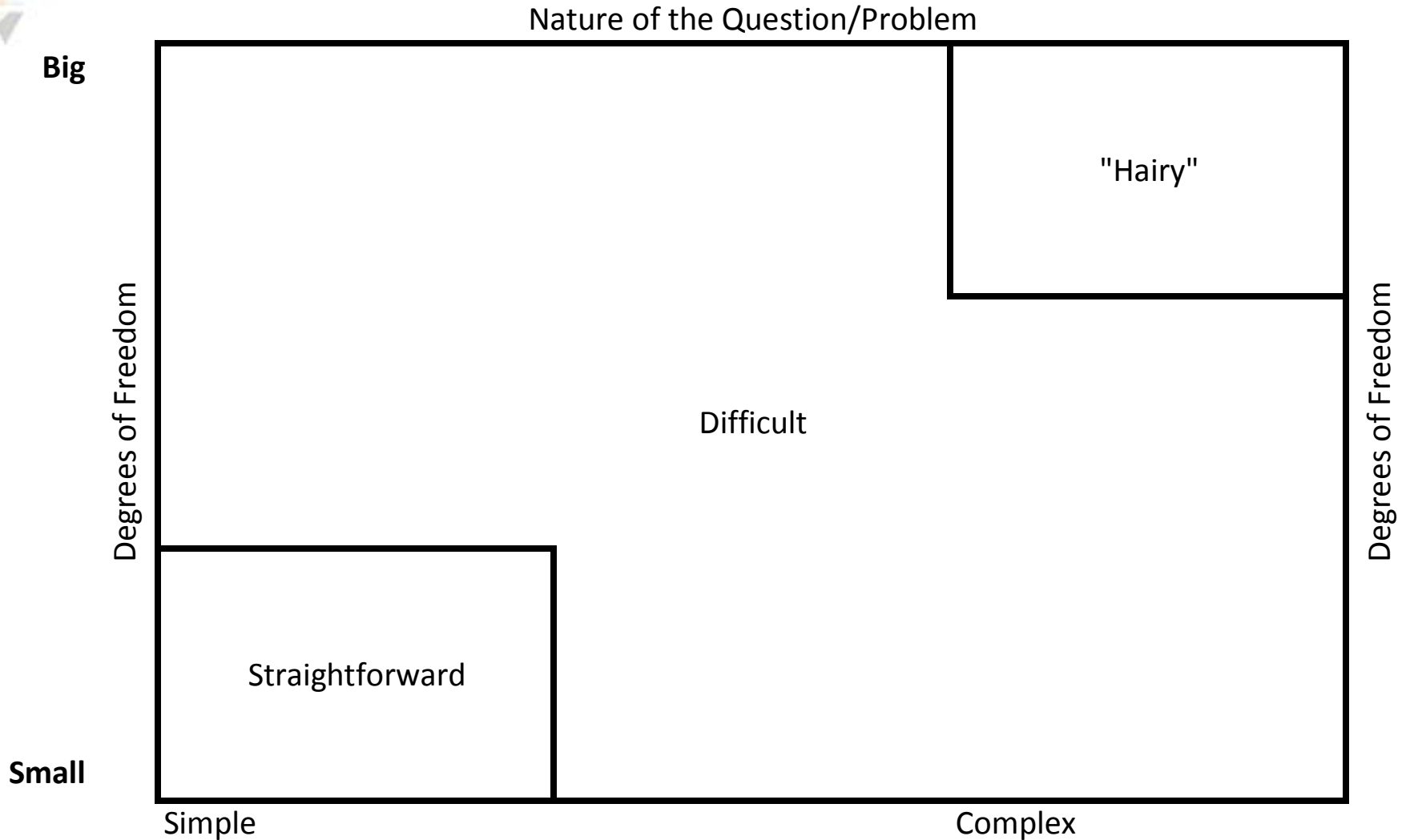 - Have specialists
  - Designers do CAE

Market Size: ~$2B

- ANSYS $390M
- DS $250M (COSMOS, Abaqus, CATIA Analysis)
- MSC $247M
- ALTAIR $140M (private)
- Siemens $120-150M
- CD-Adapco $60M
- Moldflow $58M
- LMS $30M

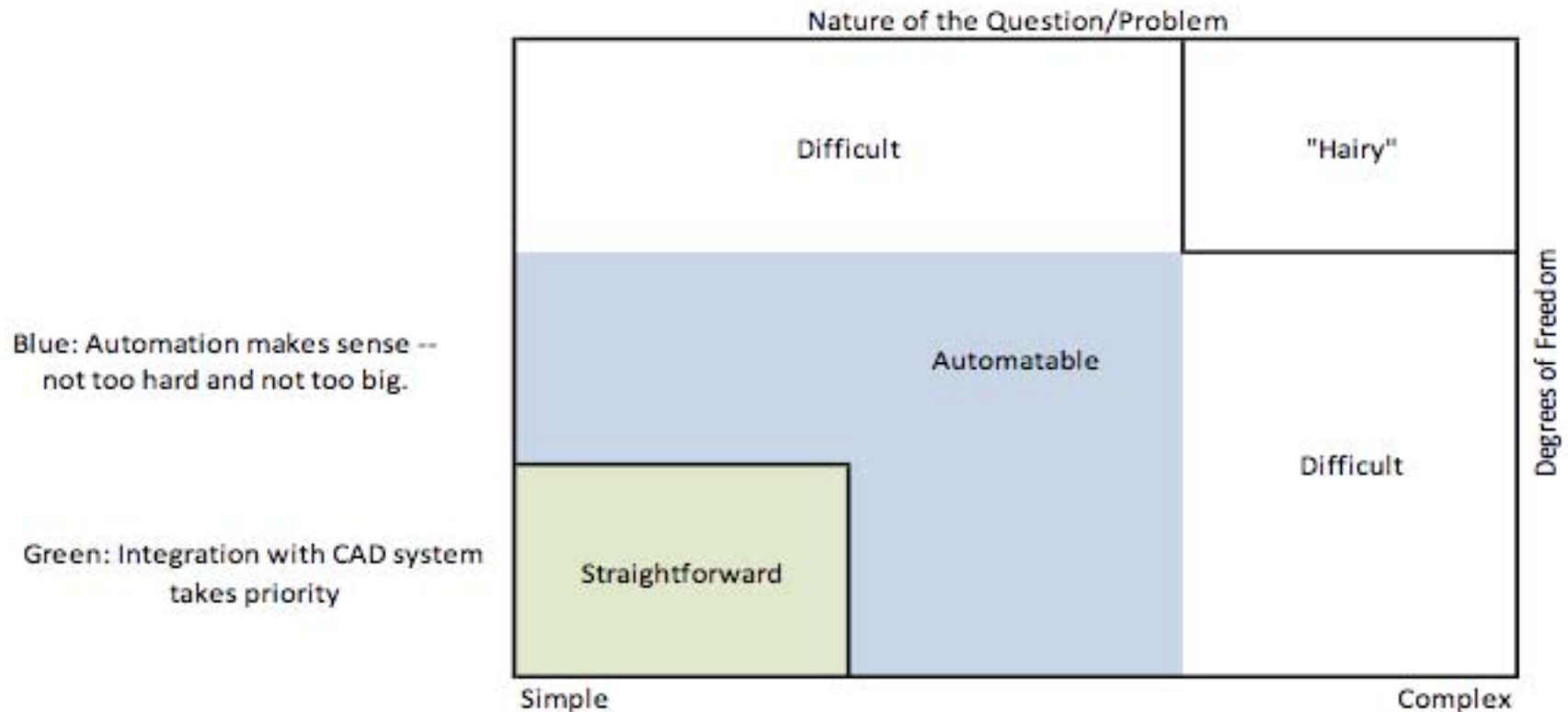# "Straightforward" to "Hairy"

Nature of the Question/Problem

Big

Degrees of Freedom

"Hairy"

Difficult

Degrees of Freedom

Straightforward

Small

Simple

Complex

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NA

Where Automatable Processes Make Sense

Degree of Automation
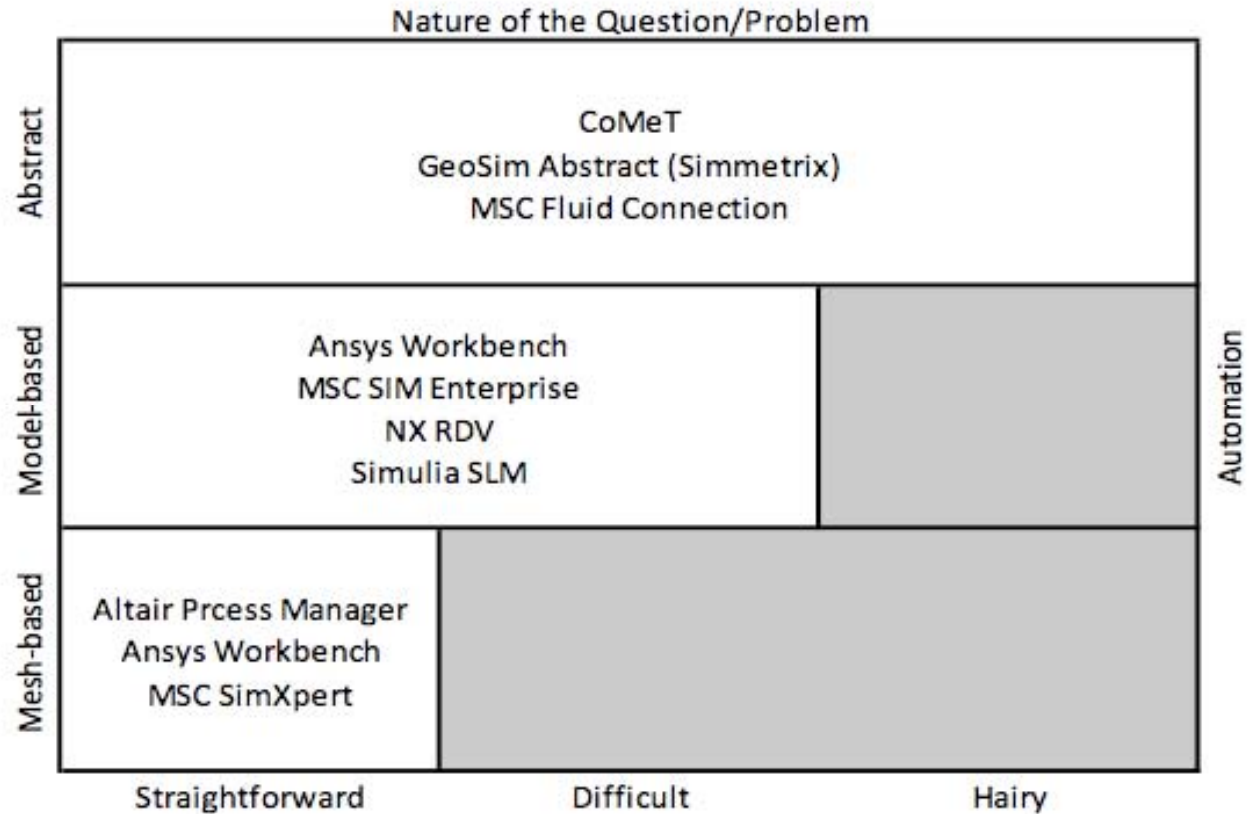
Abstract CAE Modeling

CAE models based on engineering and relationships, independent of geometry or topology.

Model-based Templates

CAE models based on engineering and relationships, specific to a particular geometry or topology.

Mesh-based Templates

CAE templates for specific load cases or geometry.

Nature of the Question/Problem

	Straightforward	Difficult	Hairy
Abstract	CoMeT GeoSim Abstract (Simmetrix) MSC Fluid Connection		
Model-based	Ansys Workbench MSC SIM Enterprise NX RDV Simulia SLM		
Mesh-based	Altair Prcess Manager Ansys Workbench MSC SimXpert		

Automation

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FEA Workflow vs. Difficulty

FEA

Nature of the Question/Problem

Integral
This is either an integral part of the program or appears that way to a user. API integration with best-in-class "integral" systems using common data structures and API calls to provide seamless integration between CAD and CAE applications.

Integrated
This requires a second program to be launched, without exiting the current program. When the second program has finished, the user is returned to the first program, which is still in the same state as it was before the second program was launched.

Standalone
Relying on "over the transom" exchanges. This requires the user to exit from the current program back to the operating system to run a second program. The process may or may not be automated, and may require the user to manually specify program and data files.

	Straightforward	Difficult	Hairy
Integral	CATIA Analysis Femap Express Inventor Professional NX CAE SolidWorks	COSMOSWorks Advanced Professional (SolidWorks Simulation)	
Integrated	ALGOR Professional Static/LM Femap with Nastran	ALGOR Professional MES Ansys Workbench Femap with Nastran MSC Nastran MSC SimDesigner NX CAE	
Standalone	ALGOR Professional Designer Comsol	Abaqus Ansys Workbench Comsol Hypermesh/Hyperworks MSC Nastran/MSC SimXpert/MSC SimManager NX Nastran Star-CD	Abaqus AMPS Ansys Workbench CoMeT LS-DYNA NX CAE PAM Crash Radioss

Workflow

The Future of MCAE

- Market shift toward universal use
- System-level integration and simulation
- "Straightforward" to lead
- MCAE moving from "desirable" to "essential

Our Question & Our Answer

- How can MCAE be used to drive decisions in a timely way?

- By making its power more broadly available within the engineering organization and by recognizing its strategic competitive value

What's Next for Us?

- PIDO & Abstract Modeling
- Bottom-Up Simulation

Thank You!

- Free white paper:
  www.cyonresearch.com/whitepapers

- Explore COFES 2009: **www.cofes.com**

- Contact me: joel.orr@cyonresearch.com