ANSYS 14.5 Overview

YY. Perng
ANSYS, Inc.
Outline

• Geometry
• Meshing
• Design Exploration
• GPU
• Multiphysics Coupling
• EKM (Engineering Knowledge Manager)
• Remote Access
9:00-10:15am

- Advanced meshing solutions
- Always better usability
- Faster, more robust simulations
- Shape optimization innovations
- Advanced physics for specialized applications
- Advanced multiphase modeling
- Turbo-Machinery specific solutions
- Internal combustion engines specific solutions
- Extended Multiphysics capabilities
ANSYS Structural Mechanics 14.5 Highlights

10:30-11:45am

• Large and Complex Models
  – Tree Filtering / Tagging Tree Objects / Connections Worksheet / Object Generator / Sub modeling / Performance enhancement

• Customization
  – Acoustics ACT

• Linear Dynamics

• Material models

• Cyclic & Linear Periodic symmetry

• Fracture Mechanics

• Additional Control for Contact Modeling

• Modeling Composite

• Improved External Data Mapping

• Miscellaneous features in ANSYS Mechanical
ANSYS Electromagnetics and Electronics 14.5 Highlights

11:45am-12:15pm

- EM Introduction
- Application Examples
- Key Existing Features
- New Enhancements
  - Enhanced Functionality
  - HPC
  - Pre-processing
Geometry
ANSYS 14.5 Geometry Highlights

Geometry Interfaces
- Support for new CAD releases
- Speed Improvements for large models

ANSYS DesignModeler
- Performance Improvements
- Usability Improvements

SpaceClaim Direct Modeler
- 2012 Release
- 2012+ Release
- Network installation
- Workbench integration enhancements
- Robustness
## Geometry Interfaces

<table>
<thead>
<tr>
<th>Geometry Interface Name</th>
<th>Supported CAD Versions</th>
</tr>
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<tbody>
<tr>
<td>ANSYS Geometry Interface for Creo Parametric</td>
<td>Pro/E Wildfire 5(Creo Elements/Pro), Creo Parametric 1, Creo Parametric 2</td>
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<tr>
<td>ANSYS Geometry Interface for Creo Elements/Direct Modeling</td>
<td>Creo Elements/Direct Modeling 17.0, 18.0, 18.1</td>
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<tr>
<td>ANSYS Geometry Interface for NX</td>
<td>NX 6.0, NX 7.5, NX 8.0</td>
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<tr>
<td>CADNEXUS/CAPRI CAE Gateway for CATIA V5</td>
<td>CATIA V5 R19, R20, R21</td>
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<tr>
<td>ANSYS Geometry Interface for CATIA V5</td>
<td>CATIA V5 R22</td>
</tr>
<tr>
<td>ANSYS Geometry Interface for SolidWorks</td>
<td>SolidWorks 2011, SolidWorks 2012</td>
</tr>
<tr>
<td>ANSYS Geometry Interface for Solid Edge</td>
<td>Solid Edge ST3, ST4</td>
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<tr>
<td>ANSYS Geometry Interface for JT</td>
<td>JTOpen 8.0, 8.1</td>
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<td>ANSYS Geometry Interface for ACIS</td>
<td>ACIS R22</td>
</tr>
<tr>
<td>ANSYS Geometry Interface for Parasolid</td>
<td>Parasolid 24.1</td>
</tr>
<tr>
<td>ANSYS Geometry Interface for Teamcenter</td>
<td>Teamcenter 8.3</td>
</tr>
</tbody>
</table>
Mixed Geometry Types

New option for target geometry type on Import/Attach:

• **DesignModeler**
  – Full conversion to DM’s internal representation (Parasolid)
  – Traditional behavior, one size fits all

• **New Workbench Import Option**
  – Convert to “Light-Weight” B-rep
  – Faster import from CAD system into DesignModeler
  – DM converts entities during modeling, on the fly, as needed
  – Model may be in two formats at once, managed internally
DesignModeler

• Large model reading time reduced
  – 25%
  – 10X

• Smarter handling of databases
  – Reload only modified parts
  – Associatively linked models show biggest improvements

• Transfer to Meshing faster
  – 20-40% faster
Usability Improvement: Axis Input via Face Selection

Use a cylindrical, conical, etc. face to define axis for:

• Translation/Rotation
• Extrude about axis
• Etc.
Usability Improvement: Move/Align

Align bodies

- Alignment points, and/or face normals, and/or axis via face selection

- Popular Gambit feature
Now two options for Workbench integration

• Add-in mode
  – Integrated with Workbench project system and file management
  – Traditional (14.0) behavior

• Plug-in mode (new)
  – Independent launch and file management (user responsibility)
  – Same as other Workbench associative CAD interfaces

Robustness improvements

• Persistence during geometry update
• Transfer of named selections

Network installation
SpaceClaim 2012+ Upgrade

Upgrade to SpaceClaim 2012 technology
• Shipped with ANSYS 14.5
• Enhancements in:
  – Manufacturing
    • Mastercam, Esprit integration, weld symbols, broken views, sheet metal formed bends
  – Mesh Modeling and Remodeling
    • STL and Mesh tools, mesh splitting, selection and coloring options
  – Solid Modeling
    • Performance improvements, radial move, curve filling, section properties
  – API
    • Animation handlers, customizable structure tree
Meshing
Areas of focus:
• Workflow and usability
• Robustness
• Hex meshing
• Fracture (crack tip) meshing
• Data Integration with Workbench project system:
  – Fluent Meshing
  – ICEM CFD
14.5 Workbench Meshing: New Mesh Visibility Option

- **Automatic** = Default
  - Same behavior as in 14.0
- **Manual** = New Option
  - When this option is used, mesh display is only linked to the “Show Mesh” toggle.
  - Use this with large models to access mesh controls without mesh having to be drawn.
14.5 Workbench Meshing: New Mesh Visibility Option

Compute Metrics
Find problems
Then turn on mesh
14.5 Workbench Meshing: Improved section plane handling

New button in the Section Plane pane to Edit Section Plane

- By default dynamic section plane is disabled in 14.5
- User can turn it on for dynamic plane editing

14.0 option to disable section plane editing has been removed.
14.5 Workbench Meshing: Object Generator

• Object generator allows user to copy objects attached to 1 object to several.

• With mesh controls it provides an easy way to assign similar controls to a group of objects. For example:

Object Generator allows you to copy the controls to 3 other parts in easy fashion.
14.5 Workbench Meshing: Object Generator

- Object generator copies selected control to selected bodies:

Source Faces come from a Named Selection. This could be created based on instance information if it exists, or similar sized faces, etc.

Inflation, match, etc. controls could be generated in the same manner.
MultiZone improvements

- Improved face meshing
  - Surface mesh methods: Program controlled, Pave, Uniform
  - Support for Advanced Size Function
- Edge biasing and hard/soft sizes
- Improved imprinting, map-ability, side handling, inflation
14.5 MultiZone Hex Meshing: Improved surface mesh quality

- **Surface Mesh Method control added to MultiZone:**
  - Program Controlled: Default, program decides on best option
  - Uniform: Traditional approach, uses recursive loop splitting
  - Pave: Gambit approach, uses paving

- **On model resume (reading 14.0 model to 14.5):**
  - Surface mesh method set to Uniform so mesh is similar

In this case, program controlled is same as Pave, in others the mesh could be more uniform
14.5 MultiZone Hex Meshing: Support for Advanced Size Function (ASF)

- All ASF Types supported
  - Surface mesh method=Uniform does not use SF info, so recommend using Program controlled or Pave with ASF, unless using fixed option.

- ASF is used for face and edge sizing
14.5 Workbench Meshing: Fracture

• New option to add crack initiation location and crack tip to model
  – Support for quadratic tet mesh
  – Support for curved faces (but not corners or multiple faces)

• Improved LCS options to help locate crack tip
Fluent Meshing 14.5: Introduction

- Fluent Meshing overview
  - TGrid and Fluent share same GUI under Fluent at 14.5:
    - “ANSYS TGrid” is replaced by “ANSYS Fluent Meshing”
    - Installing Fluent will also install Fluent Meshing
    - Licence structure changes: “ANSYS Fluent Meshing” needs either
      - Standard TGrid / Extended Meshing License key (independent)
      - ANSYS Fluent / ANSYS CFD license key (shared)
    - All TGrid and Fluent functionalities are preserved.
  - To start Fluent Meshing from Fluent Launcher
    - Select the “Meshing Mode” option
  - Fluent Meshing GUI
    - Aligned with Fluent look and feel
Fluent Meshing 14.5: in Workbench

- “Fluent (with TGrid Meshing)”
- Ability to use parameters for Fluent solver only
- Ability to link to downstream applications from Solution

**NOTE**
- You can not link DM /CAD/plug-ins/readers to Fluent Meshing in the project page
- No parametric changes in geometry or mesh
ICEM CFD: Data Integrated application

Full power of ICEM CFD with:

- Access to parameter manager, DesignExplorer
- Workflow is saved in project
- Direct access to upstream/downstream apps
Design Exploration

Fluid Dynamics  Structural Mechanics  Electromagnetics  Systems and Multiphysics
• Focus on Optimization
  – Direct optimization methods
  – Expose existing optimization methods as direct methods
    • Sampling, NLPQL and MOGA
  – Added new Adaptive Optimization methods
    • Adaptive Single Objective (K-NLPQL)
    • Adaptive Multiple Objective (K-MOGA)
  – New MISQP (Mixed Integer) algorithm
    • Support for discrete parameters
  – Initialize RS based Sampling optimization with min/max search results
Speeding Up Design Exploration
— More Cost-Effective and Feasible

Analyze more design variations in less time, resulting in more insight and better products at a lower cost

Before 14.5
- Sequential execution could result in very long solution times
- Cost of simultaneous execution could be financially impractical

New feature at 14.5
- Enhanced RSM and simultaneous design point technology along with a new license product, i.e. HPC Parametric Pack
Speeding Up Design Exploration
— More Cost-Effective and Feasible

New at 14.5
- ANSYS HPC Parametric Pack

Scalable, like ANSYS HPC Packs
- Enhances the customer’s ability to include many design points as part of a single study

Amplifies complete workflow
- Allow users to run N design points simultaneously, multiplying the “base” license(s)
- Design points can include execution of multiple products (pre, meshing, solve, HPC, post)

Limitations
- Parameters need to be in ANSYS Workbench
- ANSYS Mechanical/Multiphysics Solver only product not supported
- Sequential execution of geometry updates
GPU
Multiple GPU Support

Versions 13 & 14:
• Number of GPU limited to one per node

Version 14.5 new feature:
• Multiple GPUs per computing node to reduce solution time

Mechanical:
• Sparse solver now supports multiple GPUs

Fluent:
• Viewfactor computation
• UDF compilation using OpenCL APIs
• AMG solver acceleration

2.1M DOF, Nonlinear Static Analysis
Multiphysics Coupling via Workbench

- 2-way Coupling of Fluent, Mechanical with HFSS and Maxwell
  - Heat losses from HFSS and Maxwell to Fluent and Mechanical
  - Temperature from Fluent and Mechanical to HFSS and Maxwell
  - Forces from Maxwell to Mechanical
  - Displacement from Mechanical to Maxwell

Mapped Loss

Electromagnetics

Temperature
EKM: Simulation Templates

- EKM Studio offers a code-free, drag and drop UI and prototyping tool for creators of process templates. This includes a standard library of common UI widgets, all of which means faster time to completion thereby increasing productivity.
Remote Access
Access EKM Repository using Web, Mobile devices and Workbench interface
Allow client applications full access to the Fluent solver using Fluent as a Server

A client application can perform:

- Case setup
- Initialization
- Solution iteration
- Results reporting

A client can be a:

- Fluent Remote Console (included, precompiled client application)
  - TUI commands and file transfer
- Simpler, Matlab, Python, etc. by using the Fluent as a Server SDK
- Platform independent connections
Summary

ANSYS 14.5 brings:

• Better usability
• Faster and more robust simulations
• Improved multiphysic integration in Workbench platform
• Integration of advanced meshing tools
  – TGrid in Fluent
  – ICEM CFD in Workbench
• New ANSYS HPC Parametric Pack for simultaneous design point update
• Tool kits for custom templates
• Remote access
  – Fluent as a Server
  – Mobile access to EKM