What's New in Simcenter 3D 2019.2
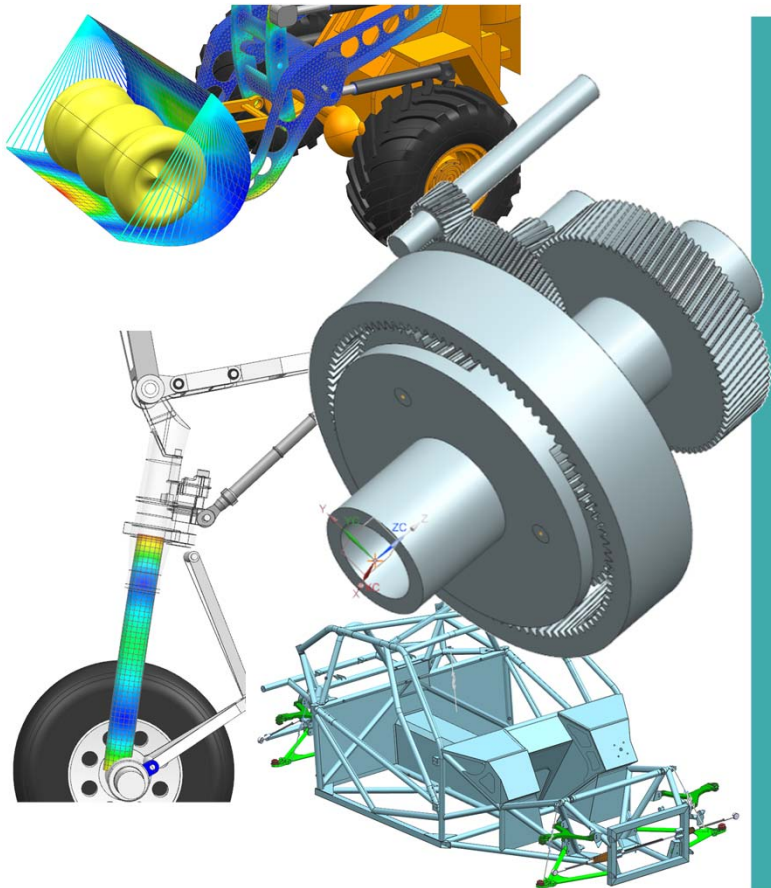## Motion & Flexible Pipe
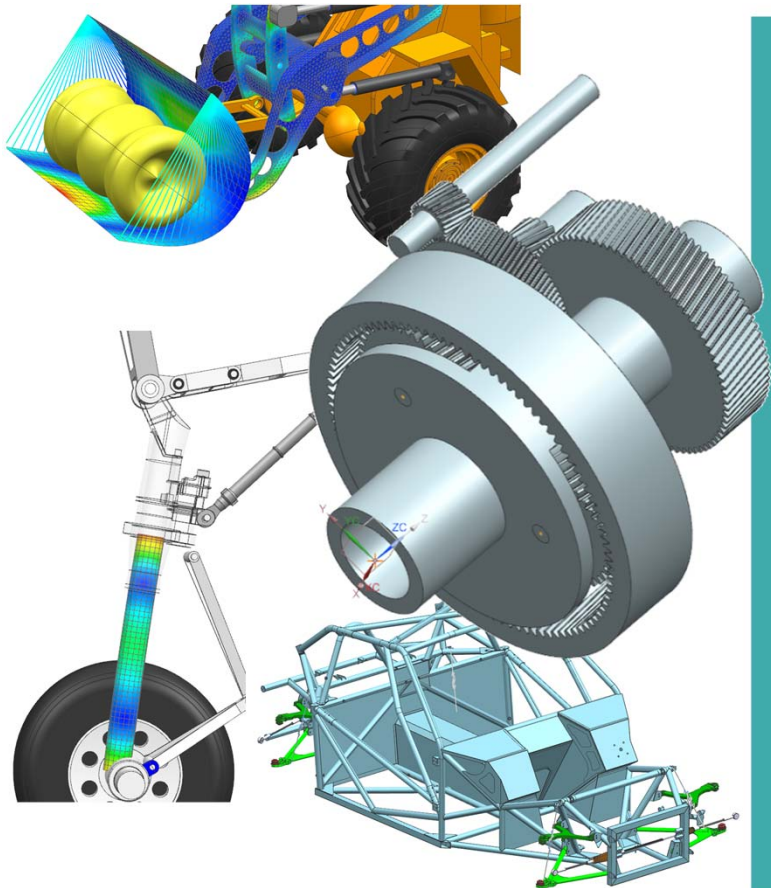
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Simcenter 3D 2019.2 – What's New
Motion & Flexible Pipe

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- **What's New in Motion**

  - Transmission Builder – Roller Bearings

  - Discrete Drivetrain – Tracked Vehicles, Chains and Belts

  - Enhancements and extensions:

    - Flexible Body

    - Mechatronics

    - Solution dialog

    - Initial Conditions

    - Universal Joints

    - Support of Assemblies Position Override

    - Results Viewer

- **What's New in Flexible Pipe**

  - Kineo Integration – Instant Update

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Simcenter 3D 2019.2 – What's New
Motion & Flexible Pipe

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Simcenter 3D Motion 2019.2 – Transmission Builder
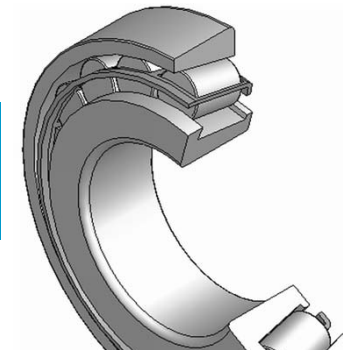## New roller bearing formulations

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> **New bearing formulations to extend capabilities for driveline simulation using Transmission Builder**

Challenge:

- Dynamic properties of linear and non-linear bushing elements are not dependent on operating conditions:
  - stiffness variation cannot be taken into account
  - not possible to define mounting conditions
- No coupling terms
- Difficult to get an accurate description of stiffness parameters

Solution:

- New bearing element allows to choose between two methods
  - Standard: capable to define **6x6 stiffness and damping** matrix
  - Analytical:
    - **Non linear behavior depending on operating conditions**
    - Parameterization based on **geometric parameters**

Simcenter 3D Motion 2019.2 – Discrete Drivetrain
Support discrete drivetrain simulation

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Support chain, track, belt and cable simulation via discrete element modelling

Challenge:

- Significant modelling effort to manually create Motion elements for each link in drivetrain mechanism
- No dedicated tools for positioning and post processing
- Drivetrain path is not associative to layout of the mechanism:
  - not possible to investigate What-If scenarios for different layouts.

Solution:

- Dedicated dialogue box for the creation and definition of discrete drivetrain elements:
  - Automatic computation of **drivetrain path associative to layout**
  - **Duplication and positioning** of drivetrain links along path
  - **Dedicated post processing** capabilities

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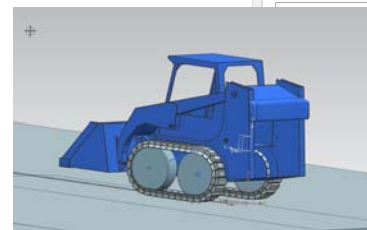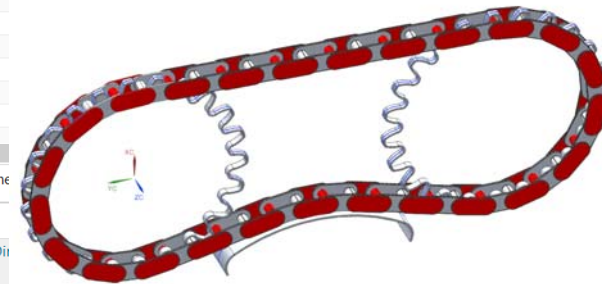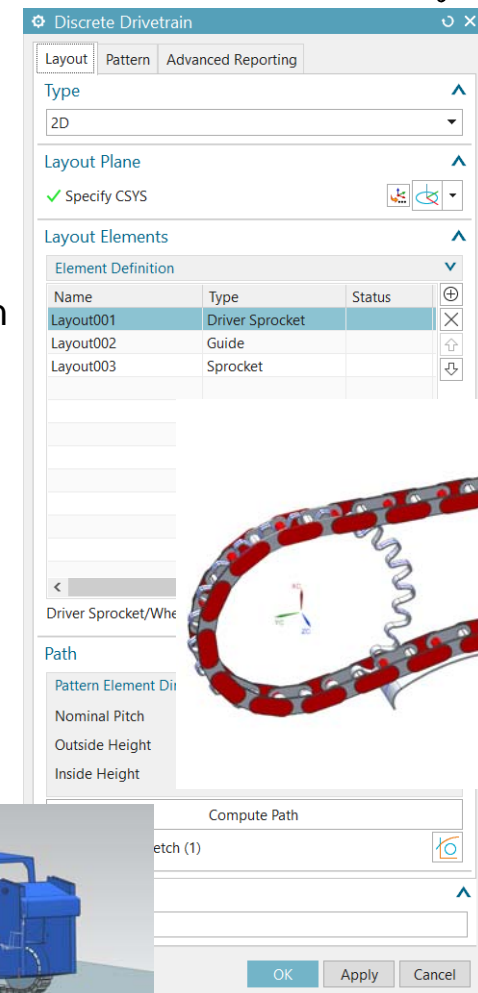
Simcenter 3D Motion 2019.2 – Flexible Bodies
Automatic Flex tool: make flex with existing FE mesh models

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Reusing existing FE models made easy

Challenge:

- Making a Motion body as flexible by starting from an existing Finite Element mesh currently requires a long manual procedure in the Pre-Post application:
  - Import FE mesh model
  - Create / edit 1D connection elements
  - Apply boundary conditions
  - Define and solve modal analysis for flex body
  - Save SIM file to be used as input to Motion

Solution:

- Extending the **Automatic Flex tool** to support the **selection of FEM files** as input.

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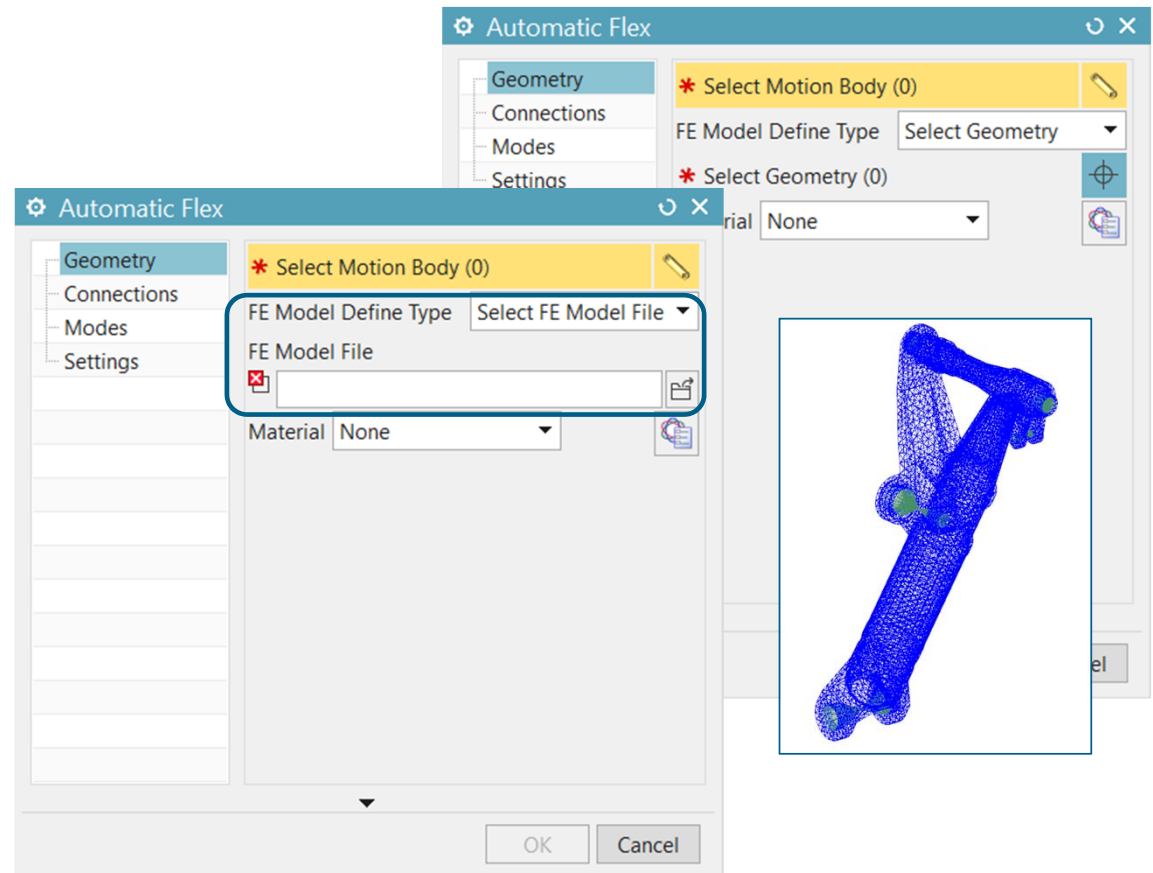
Simcenter 3D Motion 2019.2 – Flexible Bodies
Automatic Flex tool: support to multiple FE solvers

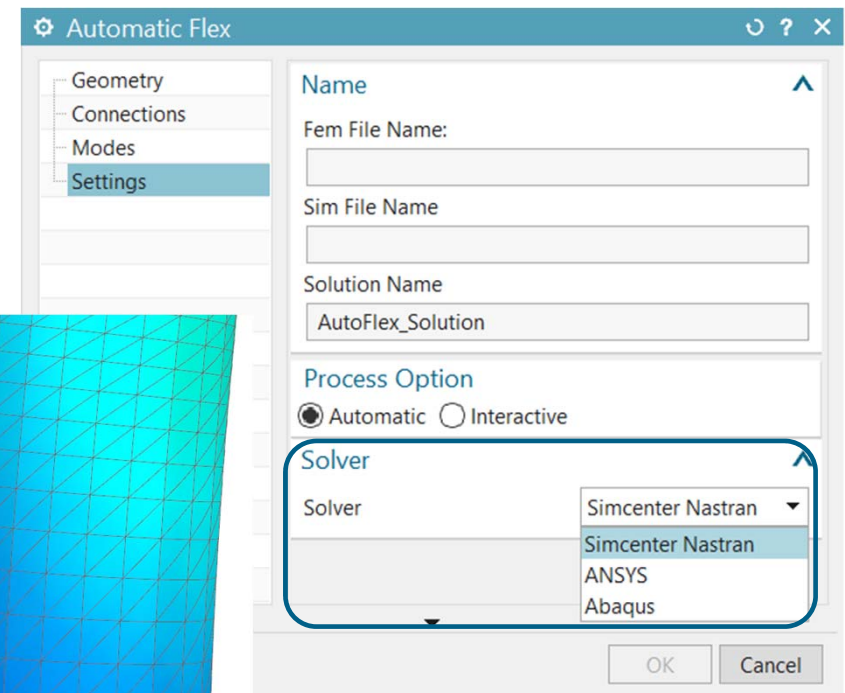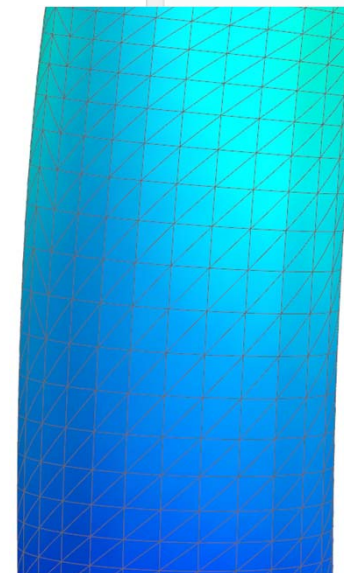**SIEMENS**
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Extending openness to 3rd party FE solvers in AutoFlex

Challenge:

- **Simcenter Nastran** is currently the only supported Finite Element solver when working with the Automatic Flex tool.

Solution:

- Extending the Automatic Flex tool to support other industry-standard Finite Element solvers:
  - **ANSYS**
  - **Abaqus**

Simcenter 3D Motion 2019.2 – Flexible Bodies
Stress & strain results available for plotting

Extending flexible bodies' stress & strain results available for Motion users

Challenge:

- Stress/strain results in time domain were not accessible from a Motion solution, even when included in the output set of the preliminary modal analysis.

- A stress recovery analysis on a Motion simulation could be done only at any selected time step from the Postprocessing Navigator, no time-varying stress values on any selected elements could be plotted.

Solution:

- Expose stress and strain results in the XY Result View section of the Motion application.
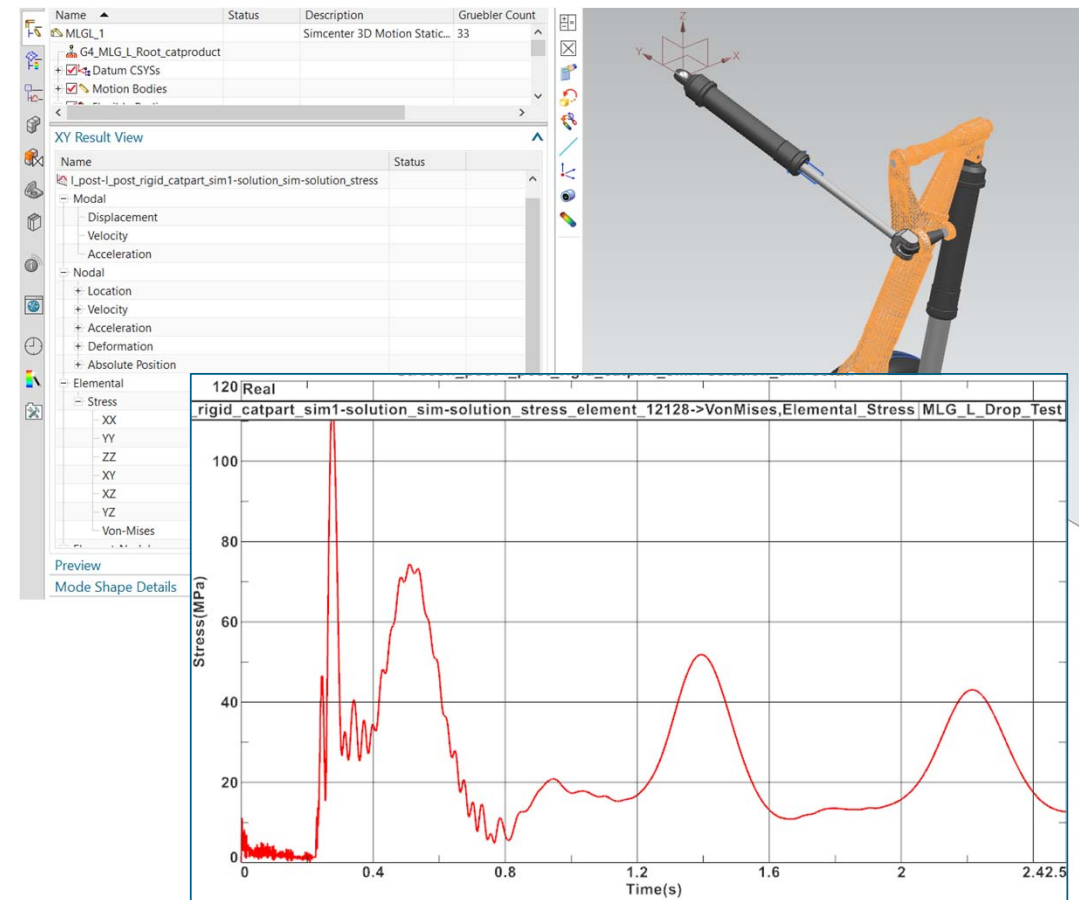
Simcenter 3D Motion 2019.2 – Mechatronics
FMI and Generic Co-simulation

**Extending the Mechatronics interface to FMI and Generic Co-simulation Openness to external solvers**

Challenge:

- Providing **UI support to text-based elements** interfacing Simcenter 3D Motion with **3rd party solvers**

Solution:

- Extending the current Mechatronics element to include the following interface types:
- **FMI** (Functional Mock-up Interface)
- **Generic co-simulation**
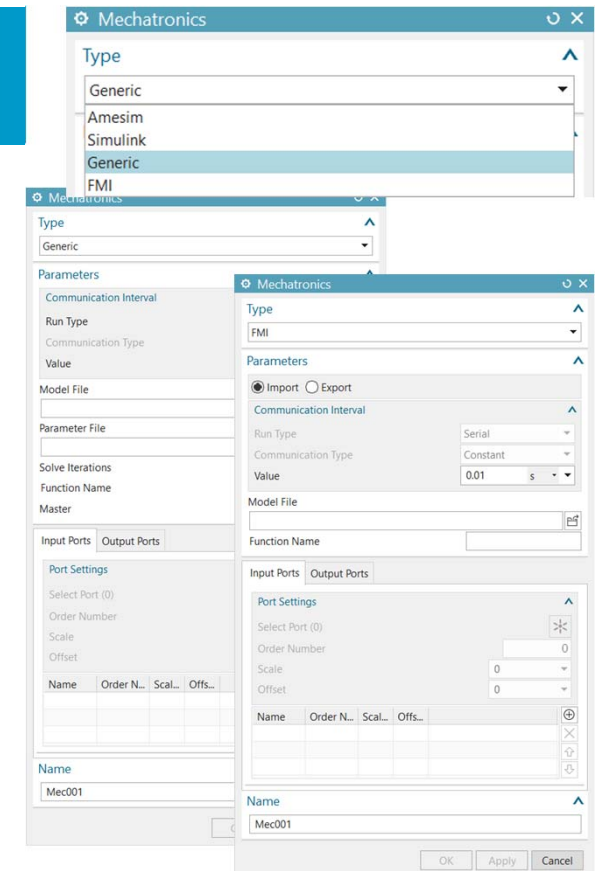
Simcenter 3D Motion 2019.2 – Solution
## New User Interface

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Exposing key solution parameters for advanced analysis and increased usability

Challenge:
- Currently some analysis/solution options supported by the Simcenter 3D Motion solver are still available only in a text-based format, fully editable but **not representing the ideal solution in terms of usability**
- In particular, many important solution parameters like solver units, output file type, restart capabilities and solution stop elements are still available only in text-based format.

Solution:
- Exposing previous text-based elements in a **new dedicated Solution UI**.

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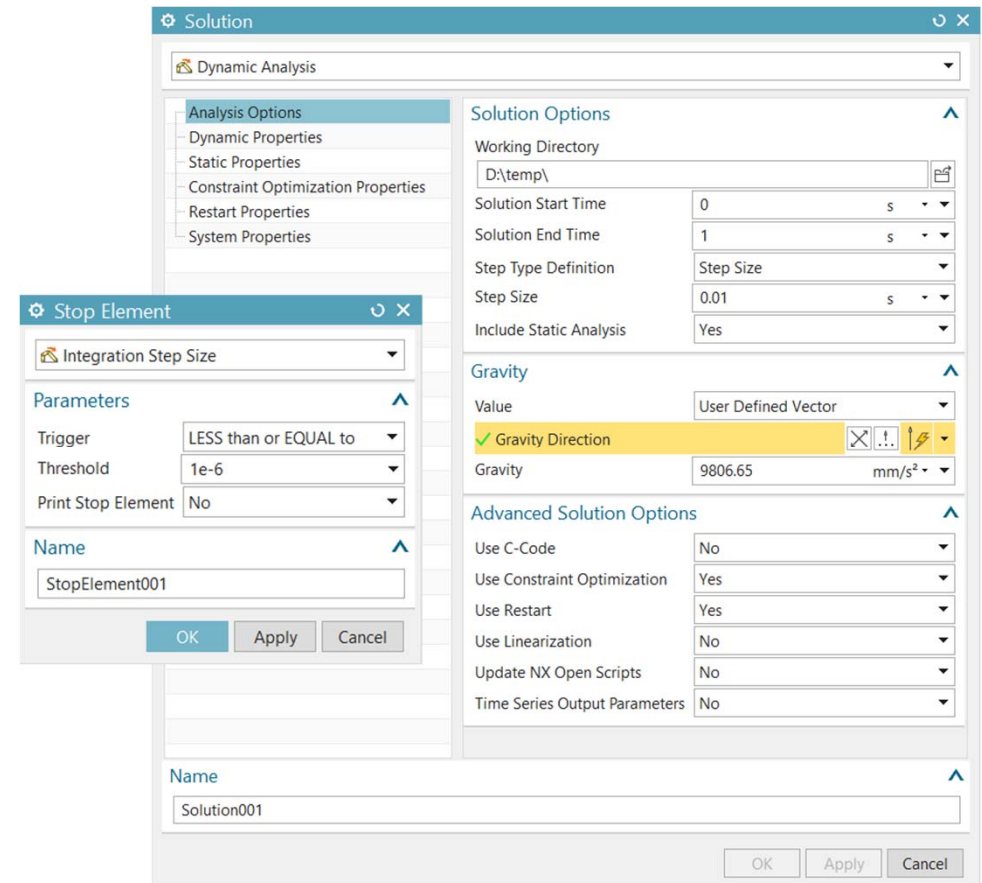
Simcenter 3D Motion 2019.2 – Solution
Initial Conditions

Promoting elements from text-based representation to full UI support

Challenge:

- Initial Conditions for Motion bodies could be specified **only from each Motion Body's dialog separately**:
- Large modeling efforts in case of several bodies in the model.
- Complex process to enable/disable ICs for any solution.
- From release 12 we support ICs as **text based elements** only.

Solution:

- Expose ICs in the Motion Navigator with a dedicated UI for the definition of the following properties:
    - Type (One Body, Tire, Flex Body, Spring/Screw Joint…)
    - Referenced element (Body, Joint…) with **multi-select support**.
    - Parameters.

Simcenter 3D Motion 2019.2 – Joints
## New definition of Universal Joint

More versatile definition of universal joints' orientation through explicit selection of rotation and cross pin axes

Challenge:

- Currently the orientation of a universal joint can be defined through the selection of one axis for each connected Motion Body and the choice of the orientation type: rotational or cross-pin.
- A more general definition of the orientation of the joint is required to enable users to explicitly define the complete geometry of a physical joint, also in those cases where the angular 'phase' is relevant.

Solution:

- Explicit selection of both rotation and cross pin axis for each body
- Full selection of all 4 axes available as an option, other combinations with a lower number of selections are also accepted as requested e.g. by Daimler
- Joint icon reflecting the actual orientation of the joint, also during solutions' animation.

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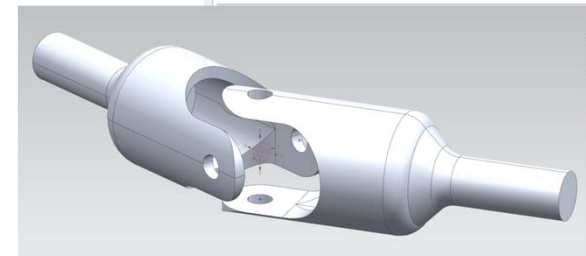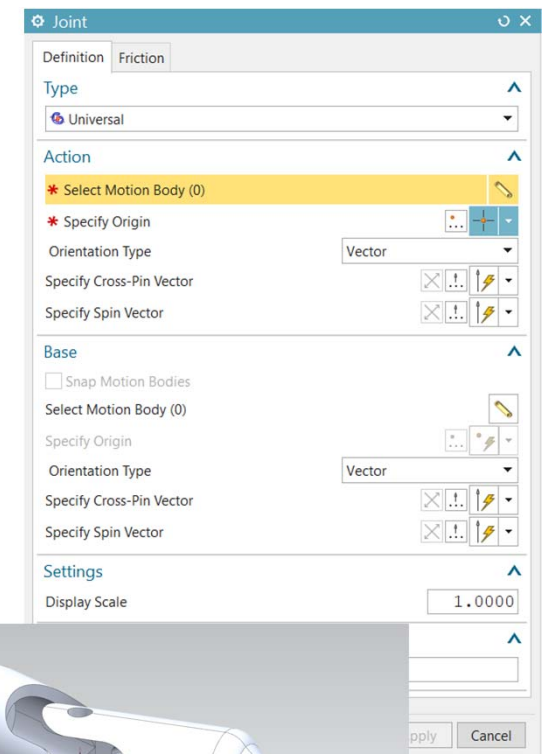
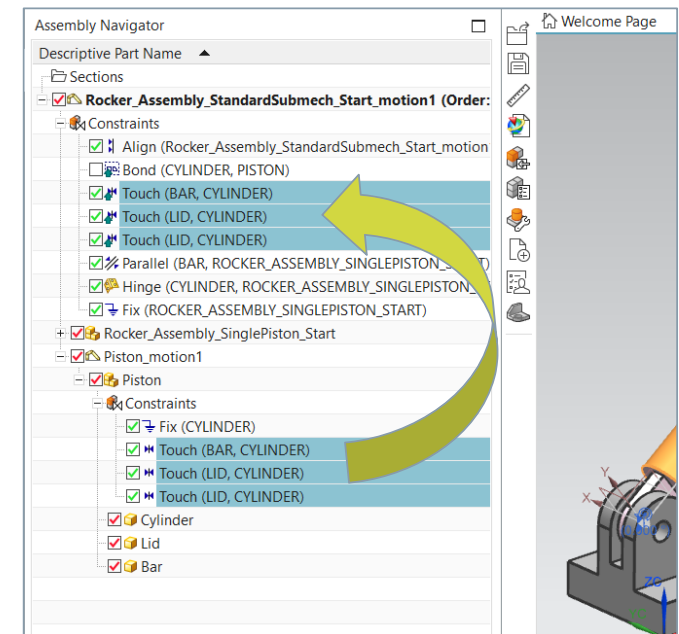# Simcenter 3D Motion 2019.2 – Assemblies
Position Override

> **Exposure of existing NX Assemblies Position Override and associative update of Motion Elements defined by Geometry**

Challenge:

- Repositioning or changes in user Assembly arrangement would not be updated in associated Motion model ➔ Motion model needed to recreate every time the geometry position changes
- Did not support associativity to NX CAD.

Solution:

- Expose Position Override for easy assembly of Submechanisms or repositioning of Assembly geometry:
  - Expose in Position Override in Motion Application for clear path forward for arranging Submechanism geometry
  - Fix hidden Motion Smart Objects that associate Motion elements to CAD features.

Position Override moves the Constraints into the Assembly active document, allowing the user to re-position the geometry

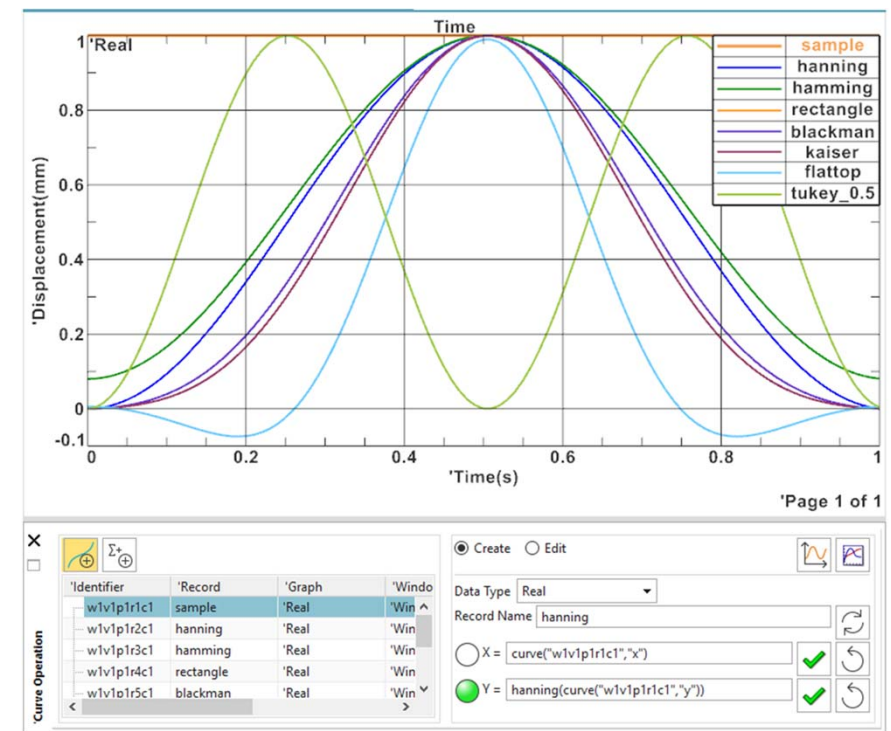# Simcenter 3D Motion 2019.2 – Results Viewer
Curve Operations Enhancements

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FFT correlation between Test and Virtual data

Challenge:

- Getting FFT calculations to match between *virtual* (Simcenter 3D) and *physical* (Simcenter Testlab).
- Usability issues with curve operation dialog boxes:
  - too many mouse clicks and dialog box pop-ups.

Solution:

- FFT calculation algorithms in Simcenter 3D Results Viewer are sourced directly from Simcenter Testlab, ensuring same FFT curves regardless of which environment the data (either virtual or physical) is plotted in.
- 7 FFT Window functions are supported: *Rectangle, Hanning, Hamming, Blackman, Kaiser, Flattop* and *Tukey*.
- Curve operation dialog enhancements to address usability issues.

Simcenter 3D Motion 2019.2 – Results Viewer
## Scenario Based Post Enhancements

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Improved Navigator based post processing

Challenge:

- Usability issues with dialogs for Scenario based post processing.
- Inconsistent and non-intuitive UI work flows – Data Sources vs. Imported Results.
- File menu gaps.

Solution:

- File menu now allows Save/Save As/Open operations for session files.
- File menu supports selection of both LMS Motion Results and Simcenter 3D Motion results files.
- Scenario based post processing is now added to Navigation Bar, reducing floating windows.
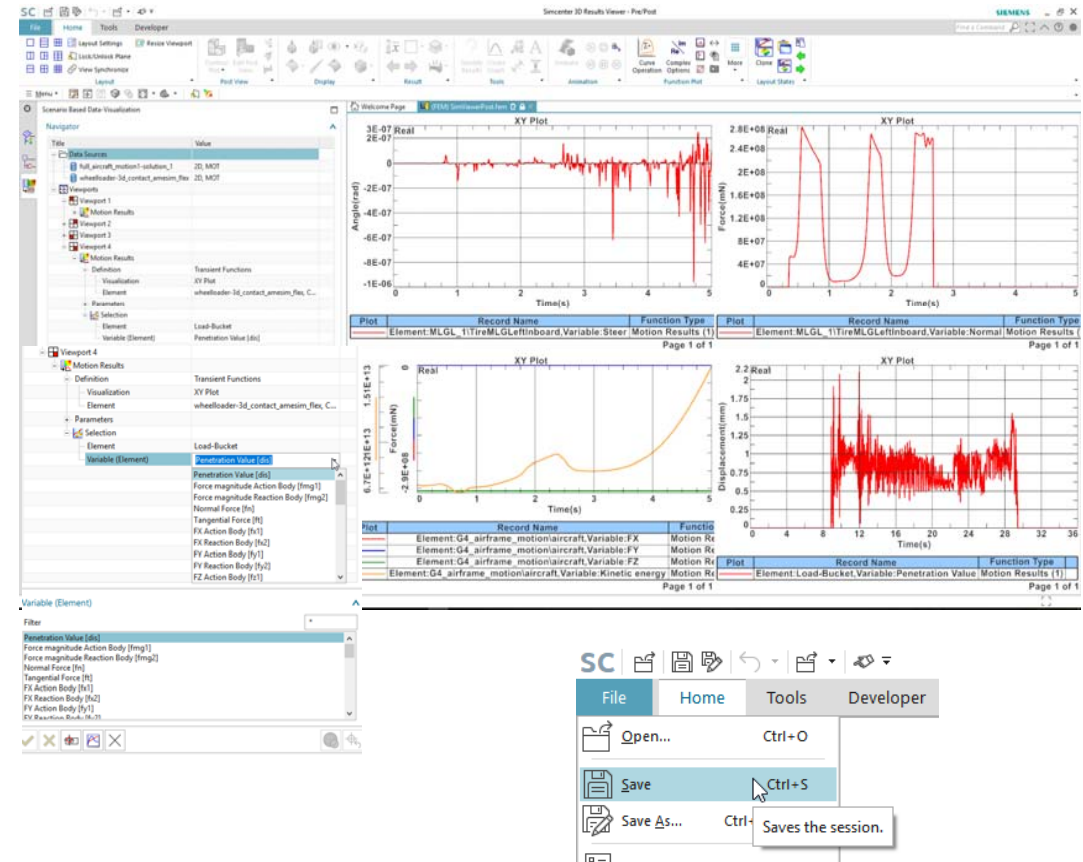
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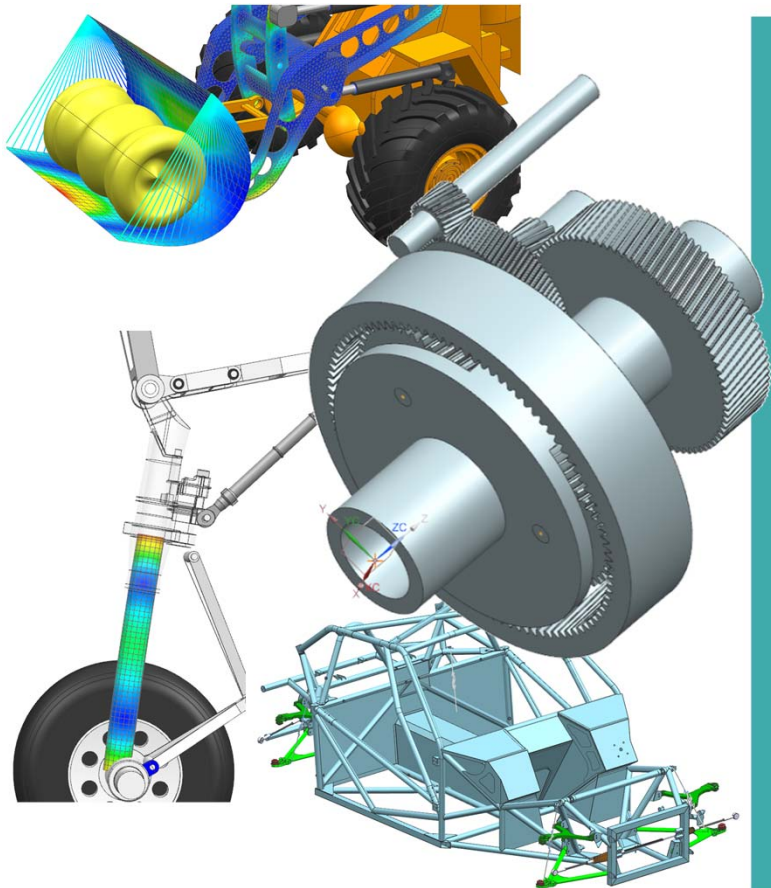
Simcenter 3D 2019.2 – What's New
Motion & Flexible Pipe

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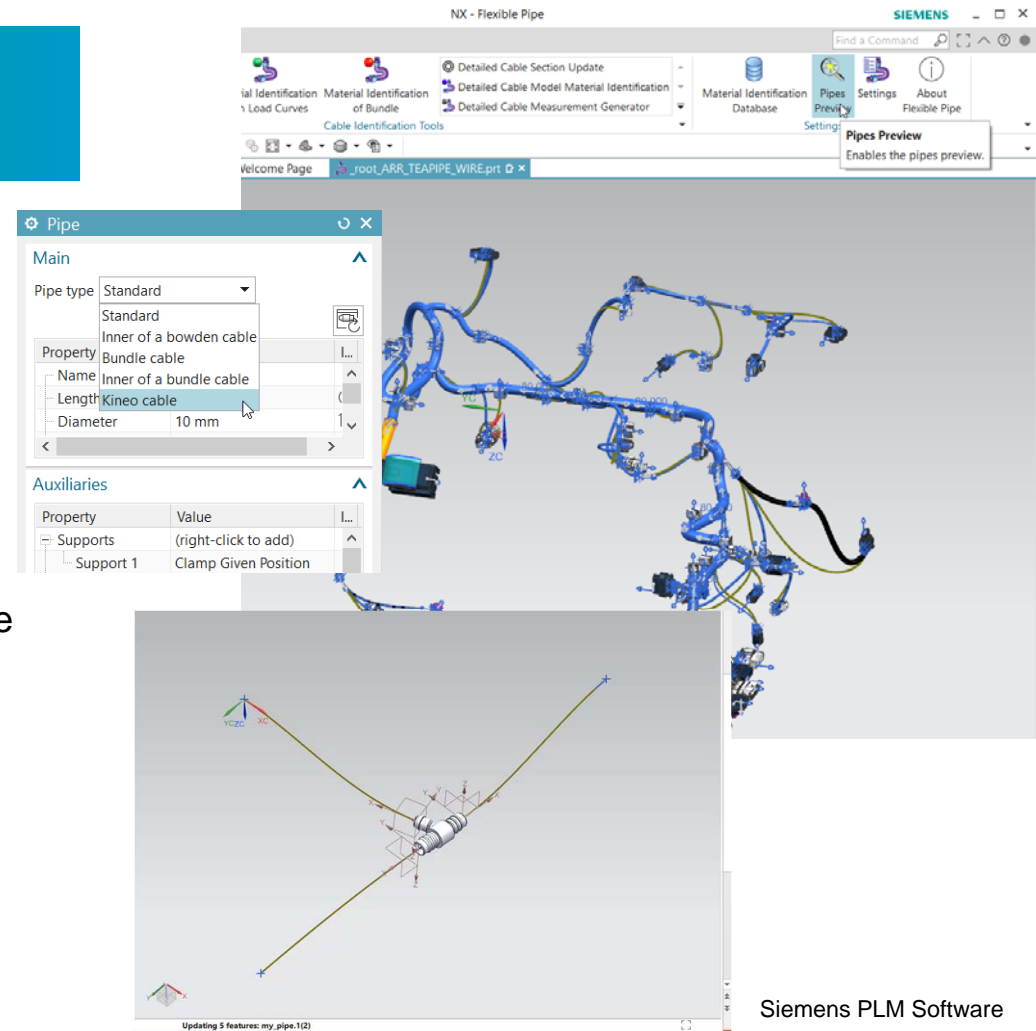# Simcenter 3D Flexible Pipe
KINEO integration

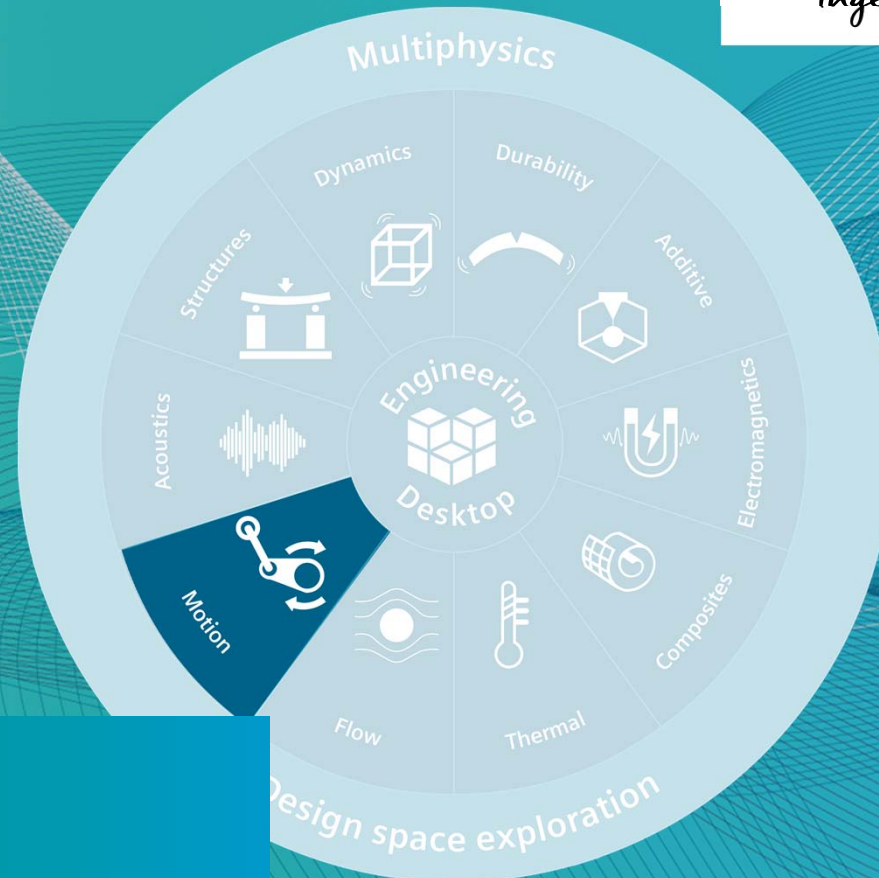## Instant Update for Predictive Concept Cable Performance

Challenge:

- Flexible Pipe runs a nonlinear FE simulation that last from some seconds to some minutes

- Users want immediate feedback on modifications to piping and mounting strategies

Solution:

- Integration of KINEO in a transparent way, allowing fast cable prediction and interactivity, in Flexible Pipe

- KINEO path planner capabilities are also partially integrated.

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Thank You!

Realize innovation.