Release Notes 2018.0 – December 2017
New Capabilities

- **Accumulated plastic strain failure indicator**
  - Critical accumulated plasticity as a function of stress triaxiality
  - Additional output: stress triaxiality in the matrix phase
  - Also available for structural analysis with Digimat-CAE and Digimat-RP

- **Improved workflow for microstructure definition of fabrics**
  - Dedicated microstructure type

- **New lattice microstructure type**
  - Applicable to model Fused Filament Fabrication dense microstructures (non-reinforced)
    - Filament cross section definition and visualization
    - Filament orientation
  - Supports Standard failure definition (Composite level)
New Capabilities

- **More efficient post-processing through automatic computation of engineering stress-strain curve**
  - Available for all RVE applications, including void phases and/or cohesive elements

- **Custom weave pattern definition for woven 3D materials**
  - Available for 3D interlock
  - Graphical editor for weave pattern definition

- **Improved workflow for microstructure definition of fabrics**
  - Dedicated microstructure type

- **New lattice microstructure type**
  - Flexible infill definition
    - Aligned (Fused Filament Fabrication application)
    - Sparse (Fused Filament Fabrication application)
    - Double dense sparse (Fused Filament Fabrication application)
    - Hexagonal (Fused Filament Fabrication application)
    - Custom 2D (Fused Filament Fabrication application)
      - Custom definition of microstructure via beams and junctions
    - Custom 3D (All applications)
      - Custom definition of microstructure via beams and junctions
  - Available for non-reinforced and reinforced materials
  - Available for elasticity and plasticity constitutive models

- **User defined failure indicator** (only available with Digimat-FE/Solver)
  - Custom failure library to be built by user
  - Instantaneous stiffness reduction is available
• **Enhancements for microstructures including curved spherocylindrical inclusions**
  o Phase definition now available based on inclusion size, diameter and number of inclusions (leading to inclusion volume fraction computation)
  o More robust geometry and mesh visualization for very large microstructures
    ▪ Geometry visualization through 1D beams and manual mesh generation if estimated mesh size is higher than 1.7M elements
  o Cohesive element definition now possible between matrix and inclusion phase
    ▪ Available for Abaqus, Marc and FE/Solver

• **New visco-hyperelasticity model**
  o Available for Abaqus, Marc and FE/Solver
    ▪ Abaqus models
      • Neo-Hookean
      • Mooney-Rivlin
      • Ogden
      • Storakers
    ▪ Marc and FE/Solver models
      • Neo-Hookean
      • Mooney-Rivlin
      • Ogden

**Notice**

Digimat-FE export functionality via script (interface to Abaqus/CAE and ANSYS Workbench) is deprecated. Users are advised to use the standard Digimat-FE mesher option as method for FEA model creation.
New Capabilities

- **Naming update**
  - The reverse engineering method “Tensile” is now named “Static and dynamic”

- **Handle shear data**
  - New experimental data loading: shear
  - Experimental data usable for reverse engineering with Static and dynamic method as well as for failure indicator reverse engineering

- **Data ordering filtering**
  - New filtering possibilities in Digimat-MX tables (Grades, Digimat Analysis Files, ...) accessible via direct right-click

- **Reverse engineering for LFRP**
  - New through-thickness definition of fiber aspect ratio and fiber volume fraction in multilayer microstructure definition

- **Reverse engineering for multiple multilayer**
  - Enhanced flexibility for microstructure definition associated to each experimental curve used during reverse engineering
  - Each experimental data can be associated to a different multilayer microstructure
  - Dedicated multilayer failure controls per microstructure
• Update of public database
  • Asahi Kasei
    ▪ New material supplier
  • DSM
    ▪ 11 new grades
  • Dupont
    ▪ 15 new grades
    ▪ 20 new models for existing grades
  • Radici Performance Plastics
    ▪ 4 new grades
  • Sabic
    ▪ 2 new models for existing grades
  • Solvay Specialty Polymers
    ▪ 8 new grades
  • Stratasys Inc
    ▪ New supplier for additive manufacturing
New Capabilities

- Manufacturing data support update
  - Molding
    - Moldflow 3D results
      - Weld line and weld surface data
      - Fiber length
      - Porosity
    - 3D Timon results
      - Fiber length
    - Moldflow UDM mesh format
    - Residual stresses
      - Export extended to LS-Dyna and Marc
  - Additive manufacturing
    - Stratasys Insight results
      - Toolpath (.txt)

- Weld line mapping
  - Export of Digimat weld line file now available in addition to element set export

- Automatic Fiber Placement
  - Loading and visualization of IGES files from AFP manufacturing software
  - Mapping to shell receiver meshes to account for defects (gaps)
    - Thickness modification (soft tooling)
    - Fiber volume fraction (hard tooling)
    - Fiber orientation
  - Export of mapped results
    - Thickness: Abaqus only
    - Fiber volume fraction and fiber orientation: all FEA
• **Air gaps mapping from toolpath files**
  - Identification of local air gaps present in a toolpath on a receiving mesh
  - Export of element set corresponding to mapped gaps location
    - Available for Abaqus, ANSYS, LS-Dyna, Marc, Pam-Crash and Radioss

• **Support of degenerated SOL186 elements (ANSYS) for receiving mesh**
New Capabilities

- CAE maintenance: supported version update
  - ANSYS, 17, 17.2, 18
  - LS-Dyna, 7.1.2, 8.1, 9.0.1, 9.1
  - Marc: 2015, 2016
  - Nastran SOL1XX: 2016 or older, 2016.1, 2017.0, 2018.0
  - Optistruct: V13, V14
  - PERMAS: 16
  - Samcef: V16, V17
  - nCode: 12, 13

- Initial stresses extension
  - Now supported with the Hybrid solution
  - Extended support of FEA software
    - LS-Dyna
    - Marc

- Weld line strength
  - Definition of a strength degradation factor when using a weld line mapped file in the manufacturing data

- Strain rate filtering
  - New parameter to filter spurious oscillations of strain rate values during strain rate dependent FEA runs
  - Available with the Hybrid solution only
  - Applicable to failure models using a (V-)EVP material model
• Stiffness reduction extension
  o Revised formulation to remove time step sensitivity
  o Control on linear softening behavior
    ▪ Definition of equivalent strain from failure initiation to final stiffness reduction
  o Available for
    ▪ Implicit & explicit FEA
    ▪ Solid & shell elements

• Fused Filament Fabrication failure modeling
  o Available for unfilled polymer materials
  o Available with the Hybrid solution

• Support of encrypted files in ACT
  o Encrypted material models now supported via direct assignment method

• Time step computation in LS-DYNA/Explicit
  o Optimized time step computation avoiding possible usage of mass scaling

• Improved stiffness matrix computation in contact and boundary conditions in LS-DYNA/Explicit and Implicit

Bug Fix

• Reading of orientation file during FEA run
  o Previously erroneous behavior: when using an orientation file which does not contain information for all integration points and using the Hybrid solution (using the default keyword Hybrid_minimize_memory = on), orientation data read for integration points beyond first integration point could be erroneous
  o Fix: orientation file data are now read correctly for any integration point even if orientation file does not contain data for each integration point
Notice

- Digi2marc libraries are now directly available from the Digimat installer. No linking operation is required anymore

- Fluent interface is now available on-request
  - Users should contact support@e-xstream.com to obtain the installer

- Virtual.lab interface maintenance is dropped
  - Users willing to access the Virtual.lab interface are advised to use Digimat 2017.1 or previous versions
New Capabilities

- **New user interface**
  - New look and feel
  - Revised workflow
    - Structural model / Digimat material / Manufacturing data / Solution settings
    - User guidance from component definition
      - Manufacturing data type
      - Material type

- **Extended support of molding manufacturing data**
  - Molding
    - Weld line data (SFRP/LFRP)
    - Fiber length distribution (LFRP)
    - Fiber volume fraction distribution (LFRP)
    - Residual stresses (SFRP/LFRP)

- **Support of additive manufacturing**
  - FFF
    - Material: unfilled polymer
      - From Digimat-MX
      - From file
    - Performance (Hybrid solution only)
      - Linear stiffness
      - Elasto plasticity
      - Elasto plasticity + failure
    - Manufacturing data
      - Toolpath (gcode)
      - Residual stresses
• **FDM**
  - Material: unfilled polymer
    - From Digimat-MX (Stratasys materials only)
    - From file (Stratasys materials only)
  - Performance (Hybrid solution only)
    - Linear stiffness
    - Elastoplasticity
    - Elastoplasticity + failure
  - Manufacturing data
    - Toolpath (Insight)
    - Residual stresses

• **SLS**
  - Material: unfilled polymer, bead reinforced polymer
    - From Digimat-MX
    - From file
  - Performance (Hybrid solution only)
    - Linear stiffness
    - Elastoplasticity
    - Elastoplasticity + failure
  - Manufacturing data
    - Global printing direction definition
    - Residual stresses

• **Extension of linear solution**
  - Abaqus now available on top of Nastran Sol1XX, Optistruct and PERMAS
  - Support of thermoelasticity

• **Control of number of material cards**
  - New linear template in Solution settings to control maximum number of material cards: reduction level
New Capabilities

- **PFA formulation enhancement for Unidirectional materials**
  - Available for filled hole and bearing tests

- **User defined material model**
  - Custom material model library to be built by user (full procedure described in Digimat documentation)
  - Definition of input parameters and outputs results in Digimat-VA user interface
  - Applicable to variability scenarios

- **First ply failure material model**
  - Available for Unidirectional composites
  - Based on Tsai–Hill 3D Transversely Isotropic failure indicator
  - Dedicated post-processing
    - Failure indicator output
    - Critical ply identification
    - Driving failure mode output

- **Additional process-related variability**
  - Ply misalignment (angle standard deviation definition)
    - Aligned plies
    - Non-aligned plies

Notice

The enhanced PFA formulation for UD in Digimat-VA 2018.0 can induce small results variations compared to previous Digimat versions, especially when using soft layups.
New capabilities

- **New FDM manufacturing type**
  - Provides access to Stratasys applications
    - Fortus 900mc printer
    - ULTEM 9085 material (available on-request)

- **Support failure modeling (FFF/FDM)**
  - Visualization of support location
  - Definition of interface strength in Material model definition
  - Definition of failure modeling approach
    - Failure index
    - Decohesion
  - Output of failure index value in Results

- **Chamber temperature definition (FFF/FDM/SLS)**
  - Enhanced definition of chamber temperature
    - Constant
    - Variable
  - Variable temperature definition via two interpolation models
    - Linear
    - Exponential
  - Inherent strain computation based on extrema chamber temperatures
  - Visualization of part temperature in results

- **Data management**
  - Support of encrypted material models for Digimat-AM
  - Inherent strain management
    - Can now be saved in Digimat-MX
      - Characterized via user-defined comments
    - Can now be loaded from Digimat-MX
• Anchor pin definition for warpage minimization (FFF/FDM)
  o In Manufacturing step, definition of anchor pin location and diameter
The Material Modeling Company

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