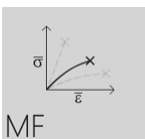
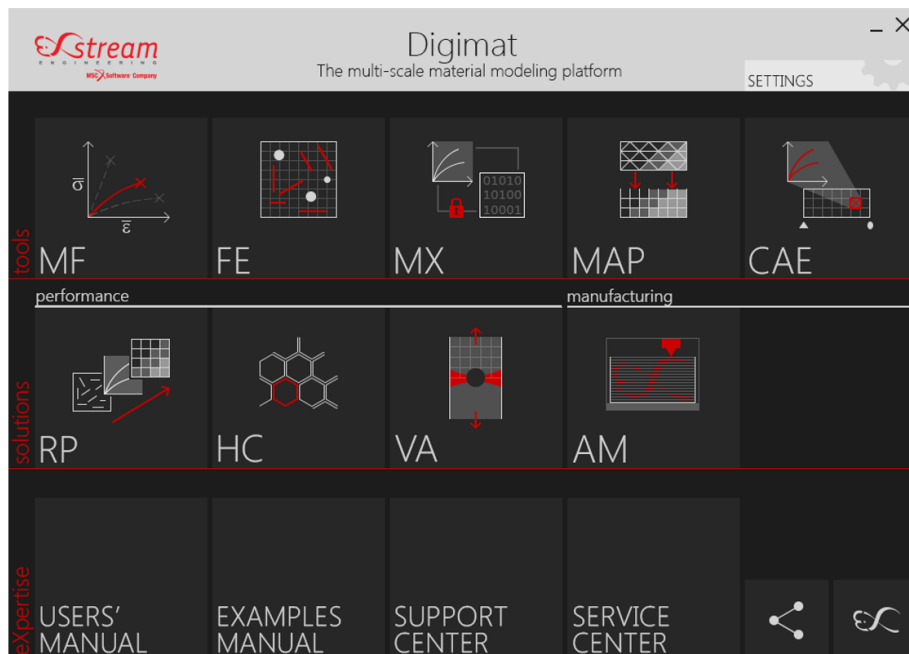
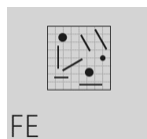




## Release Notes 2017.1 – April 2017



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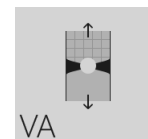
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## New Capabilities

- **Improved robustness and accuracy of advanced material models**
  - Crash: viscoelastic-viscoplastic model (VEVP)
    - Improved accuracy when using large Plastic Strain Multiplier value
  - Creep: (Thermo-)elastoviscoplastic model ((T-)EVP)
    - Improved convergence with Interaction law
    - Improved convergence at very low strain rate
  - Effect of porosity for crash of short fiber reinforced polymers: elastoviscoplastic model including void phase
    - New default: Incremental instead of discrete affine
- **Extension of Short Fiber Reinforced Plastic failure model (FPGF) to microstructures including spherical void phase**



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## New Capabilities

- **New grain inclusion type for polycrystalline materials**
  - Specific algorithm for high volume fraction of polyhedral inclusions
- **New algorithm for long wavy fiber reinforced matrix RVE**
  - Available for 2-phase microstructures defined as
    - Matrix phase
    - Curved spherocylindrical inclusion
  - Associated to new meshing technique: mesh cutting (tetra)
- **New random fiber perturbation algorithm to reach high volume fraction of inclusions in unidirectional microstructure**
  - Up to 90% volume fraction
  - Available for unidirectional reinforced material microstructures
    - Continuous fiber inclusion
    - Spherocylindrical inclusion
- **Direct definition workflow for unit cell geometries (available via random fiber perturbation option)**
  - Available for unidirectional reinforced material microstructures
    - Continuous fiber inclusion
    - Spherocylindrical inclusion
- **Enhanced boundary condition definition for Marc and FE/Solver**
  - Periodic: default tolerance is now loosened
  - Dirichlet: default tolerance is now tighter

- **Extended material model for thermomechanical analysis of woven RVE**
  - Yarn can now be modeled as thermo-elastoplastic if matrix is defined as thermo-elastoplastic
    - Available for Abaqus, Marc and FE/Solver
  - Yarn can now be modeled as thermoelastic if matrix is defined as thermoelastic
    - Available for Abaqus, Ansys, Marc and FE/Solver
  
- **Improved robustness for failure simulation including damage upon failure**
  - Marc: elasticity only is available
  - FE/Solver: elasticity and elastoplasticity are available, with revised damage computation for faster simulation run time
  
- **Extended loading definition**
  - Off-axis loadings can be defined for uniaxial testing
    - Theta / phi loading angles can now be fully user defined

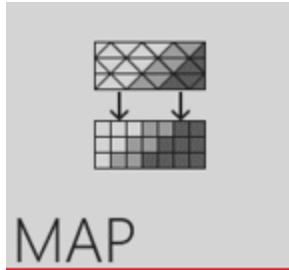


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## New Capabilities

- **Extended support of interactive reverse engineering of material models**
  - Crash: V EVP model
    - Easy step-by-step workflow for viscoelasticity and viscoplasticity parameters optimization
    - On-the-fly choice of viscous model
  - Creep: (T-) EVP model with new Creep submethod
    - Easy step-by-step workflow for elasticity, plasticity and creep parameters optimization
    - On-the-fly choice of viscous model
- **New merge tool of isothermal models**
  - Enables easy creation of thermomechanical model from several mechanical models of a same grade at different temperatures
    - On-the-fly definition of per-phase coefficients of thermal expansion

- **Update of public database**
  - DSM
    - Additional conditions for several grades: Akulon K224 (HG0,HG6,PG6,PG8) and for Stanyl TW241F10
    - Addition of new grades: Akulon Ultraflow K-FHG0, Akulon S223-HG0, Akulon Diablo HDT 2500 and Stanyl Diablo HDT 2700
    - Models are available with hybrid parameters
  - Solvay Engineering Plastics
    - MMI database updated
    - Addition of new grade for SLS: TECHNYL Powders PA6 6300 HT 110 Natural
  - Radici
    - Models updated for Radilon A RV300W, ARV350W and S RV300W
    - Addition of new grade: Radilon A RV500RW
  - Kuraray Co. Ltd.
    - Addition of 3 new PA9T grades: Genestar N1001A-M41, N1006A-M41,N1006D-H31
    - 3 new PA9T reinforced glass fiber grades: Genestar G1350A-M42, GX1500A-M61, G1301A-M61
    - Experimental data for different temperature are available
  - Sumitomo Chemical Europe :
    - Addition of SUMIKASUPER E6007LHF grade
    - Several models are available on request
  - e-Xstream
    - Addition of generic data for additive manufacturing
      - SLS: e-X\_GENERIC\_SLS\_PA12 / PA12 resin
      - SLS: e-X\_GENERIC\_SLS\_PEEK / PEEK resin
      - FFF: e-X\_GENERIC\_FFF\_ABS / ABS resin
      - FFF: e-X\_GENERIC\_FFF\_PA12 / PA12 resin
      - FFF: e-X\_GENERIC\_FFF\_PA6 / PA6 resin
      - FFF: e-X\_GENERIC\_FFF\_PEI / PEI resin



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## New Capabilities

- **Mapping of toolpath information for structural analysis of additive manufactured parts (FFF)**
  - Loading and visualization of .stl file
  - Loading and visualization of .gcode file
  - Superposition of geometry/toolpath with structural mesh
  - Mapping of toolpath to structural mesh
  - Export of an orientation file for further structural analysis with Digimat-CAE
- **Mapping of residual stresses from Digimat-AM for structural analysis of additive manufactured parts (FFF/SLS)**
  - Loading and visualization of Digimat-AM mesh (.dat)
  - Loading and visualization of Digimat-AM residual stresses (.xml)
  - Superposition of Digimat-AM mesh with structural mesh
  - Mapping of residual stresses
  - Export to FEA for native FEA isotropic analysis including residual stresses
    - Abaqus
    - Ansys
- **Support of fiber volume fraction data from 3DTimon**
  - 3D/3D mapping
  - 3D/2D mapping



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## New Capabilities

- **Structural analysis of additive manufactured polymer parts**
  - FFF
    - Unfilled polymer
    - Performance (Hybrid solution only)
      - Linear stiffness
      - Non-linear stiffness
    - Connection to manufacturing
      - Toolpath information from .gcode file
  - SLS
    - Unfilled & reinforced polymers (bead)
    - Performance
      - Linear stiffness
      - Non-linear stiffness + failure
    - Connection to manufacturing
      - Homogeneous printing direction defined in material model



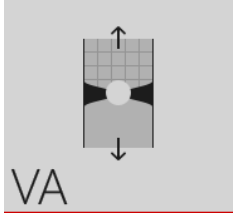
- **Extension of the Hybrid method**
  - MuCell® & metal casting: support of the effect of porosity volume fraction on material behavior
    - Unfilled & reinforced matrices (bead or fiber)
    - Performance
      - Linear stiffness (elasticity)
      - Non-linear stiffness + failure (elastoplasticity)
      - Crash (elastoviscoplasticity)
    - Failure model accessible with the Hybrid solution
      - Strain at failure dependent on porosity volume fraction as linear function
  - Creep
    - Thermo-elastoviscoplasticity model is now supported

## Bug Fix

- **Bug fix for stiffness reduction/element deletion in implicit FEA**
  - PFP output (percentage of failed integration points) computation is now corrected when non-convergence and time step reduction can occur
  - Fix residual stiffness computation for specific configurations

## Notice

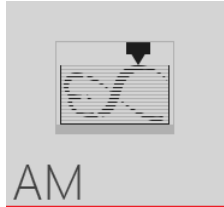
- **Digmat-CAE/Radioss, Digmat-CAE/Hypermesh and Digmat-CAE/Optistruct (plugin) are not supported in Digmat 2017.1**
  - Interface to RADIOSS remains accessible via Digmat-CAE 2017.0
  - Interface to OptiStruct remains accessible via Digmat-RP 2017.1



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## New Capabilities

- **New countersunk fastener geometry**
  - Available for filled hole and bearing tests
- **CPU time reduction & improved solver convergence**
  - Average 50% CPU time reduction for UNT/C & OHT/C tests



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## New Software for Additive Manufacturing process simulation

- **Create printing project**
  - Visualize and select printer
    - Generic SLS
    - Generic FFF
  - Define Component
    - Load geometry (.stl)
    - Define material
      - Select from database
      - Create new
- **Define Manufacturing**
  - Define part orientation (SLS only)
  - Define warpage compensation
    - Apply anisotropic scale factor
    - Load modified geometry (.stl)
  - Load and visualize toolpath (FFF only / .gcode format)
  - Define other process parameters
- **Run simulation**
  - Generate voxel mesh
    - Coarse/medium/fine/user defined mesh size
  - Define material model settings
    - Warpage computation approach: inherent strain
      - On-the-fly computation of inherent strain via micromechanical modeling
      - Direct user input
        - Mechanical and thermal
        - Total
      - From previous project

- Submit job
  - Review project definition
  - Prepare job
    - Define working directory
    - Define number of CPU
    - Output control
  - Launch job
    - Local run only
  - Monitor job
- **Post-process**
  - View results
    - Field visualization
      - Displacement
      - Stress
      - Warpage indicator
    - Visualization format
      - On voxel mesh
      - On stl
    - Warpage visualization tools
      - Scale factor for deformed shape
      - Superimpose undeformed shape
  - Export results
    - Warped shape (.stl file with user defined scaling factor)
    - Residual stresses (Digimat XML format for further usage in Digimat-MAP)
- **Transversal aspects**
  - Project management
    - New
    - Save
    - Load



MF



FE



MX



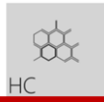
MAP



CAE



RP



HC



AM



## The Material Modeling Company

VISIT

[www.e-Xstream.com](http://www.e-Xstream.com)

INFO REQUEST

[info@e-Xstream.com](mailto:info@e-Xstream.com)

TECHNICAL SUPPORT

[support@e-Xstream.com](mailto:support@e-Xstream.com)

Support hotline: +32 10 81 40 82

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