Xp 3DXpert™
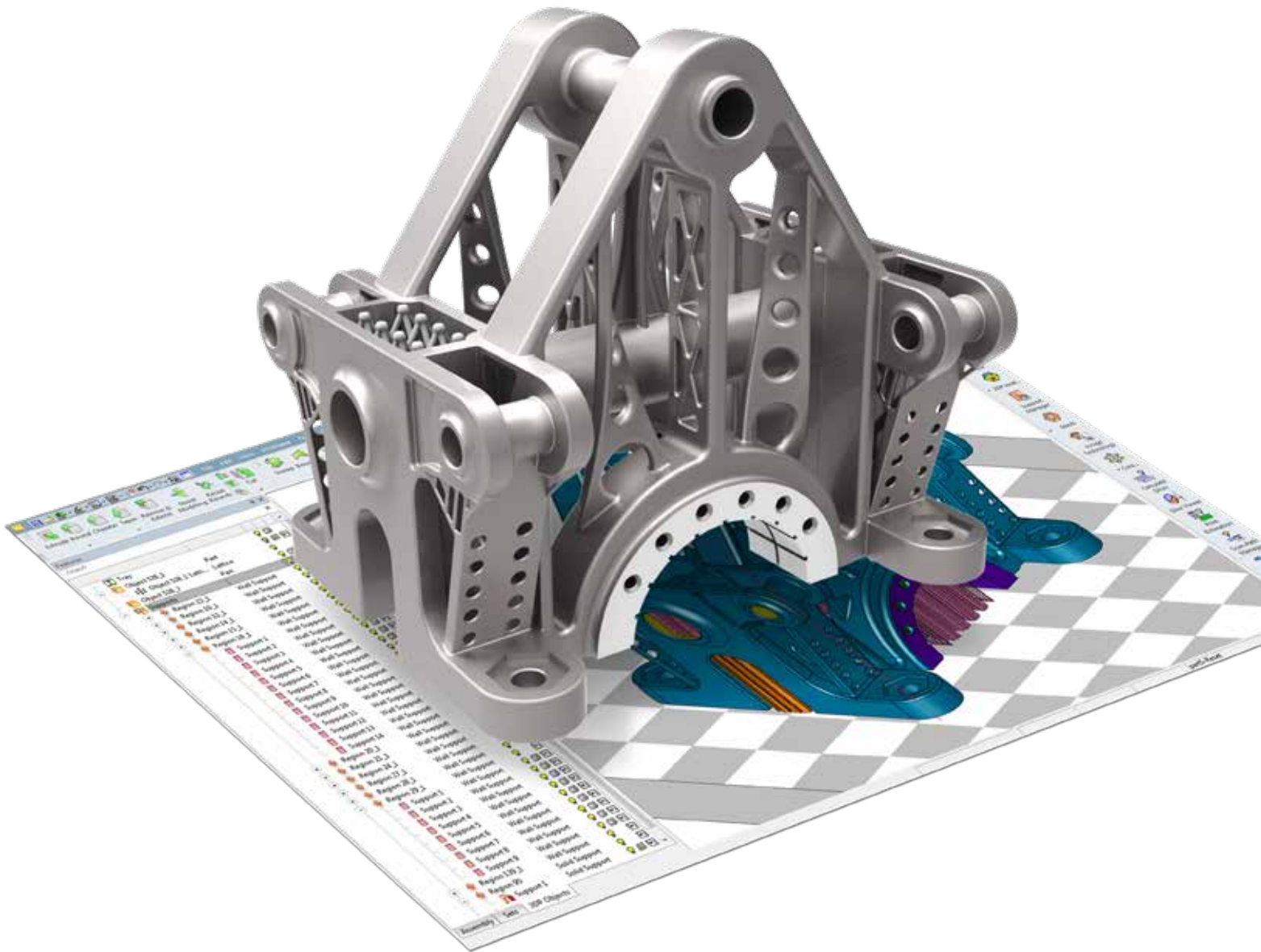
Introducing 3DXpert 16.0

3DXpert® provides a complete, integrated solution for the entire additive manufacturing (AM) workflow. It preserves data integrity and eliminates the need to work with multiple systems and data conversions, saving time and money. This software incorporates the most up-to-date technologies and capabilities for print preparation, design optimization, build simulation and scanning strategies. By using 3DXpert you will gain the confidence and expertise needed for AM serial production.

Key Benefits

Data Integrity

- Use a single, integrated system for your entire workflow
- Supports B-rep (solids) and mesh data—eliminates costly CAD conversion and healing operations
- Reads native CAD data and generic formats
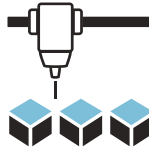
Print Preparation

- Best-in-class tools for part orientation and positioning
- Rich and customizable supports
- Advanced nesting and tray arrangements tools
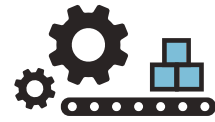
DfAM

- Full range of lattice design capabilities
- Complete design freedom and control
- Integrated FEA analysis tools for design optimization

Automation

- Scripting and workflow automation
- Template-based design (best practice templates provided)
- Enhanced performance and usability

Optimization

- Simulates printing to boost success rate
- Inspect, monitor and validate data collected during the physical print
- All-in-one platform for true integration and root-cause-analysis

Slicer

- Automatic balancing of multiple laser heads for optimal performance
- 3D zoning allows assignment of different scanning strategies to different portions of a part without splitting it

Introducing 3DXpert 16.0

3DXpert 16 offers major benefits and value to AM manufacturers across their entire range of operations. From design through simulation, lattice design and slicing, this new version helps ensure that you are more productive than ever, in your competitive marketplace.

Here are the top highlights of 3DXpert 16.0:

SHORTEN DESIGN-TO-MANUFACTURING LEAD TIME

- **Scripting** – automation and customization of AM design workflows

- **Power support** – automated support generation
  - New control options
  - New customized templates
  - Better performance and quality

- **SLS** print preparation enhancements

- **Automatic dental workflow**
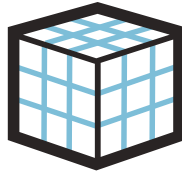
OPTIMIZE DESIGN STRUCTURE

- **Build simulation**
  - Calibration per technology
  - Compensated models per object type
  - Z component of displacement
  - Analysis-based element size

- **Lattice**
  - New conformal lattice type
  - Radial and inverse
  - Lattice FAE improvements
  - Pore size analysis

MINIMIZE MANUFACTURING COST

- **Multi-head managemen**t – more control and enhanced performance for optimized print

- **Plate management** and mini pallets for supporting downstream post-processing

- **DMP Inspection** (beta) – Automated detection and visualization of potential AM quality defects

- **3D zoning enhancement** – simple creation of virtual objects between concept and manufacturing.

Multi-Laser Optimization

Maximize productivity of multi-laser machines

Increasing the number of laser heads in a printer doesn't ensure an increase in productivity, it introduces more complexity and technological challenges that can impact the quality of the printed parts. In order to increase productivity, it is necessary to manage and run the lasers in an intelligent and optimal way.

CHALLENGE:

Manage and optimize the laser motion when multiple lasers are in use, where each laser head has its own printable area, gas flow considerations, and overlapping areas. All these parameters should be taken into consideration in order to achieve best performance and best quality.

SOLUTION:

3DXpert provides a fully automated and optimal laser head assignment, while maintaining the option for a manual assignment. The advance automatic balancing algorithm takes care of laser head synchronization, considering the gas flow direction and smooth stitching between adjacent areas scanned by different laser heads, which is highly important for the quality of the printed part. You can also have full control over the process by adjusting and customizing the parameters to meet your specific requirements. A new player mode in the scan-path viewer allows you to see the motion of all laser heads simultaneously. This unique capability helps visualize and review the action of the laser heads in each layer.
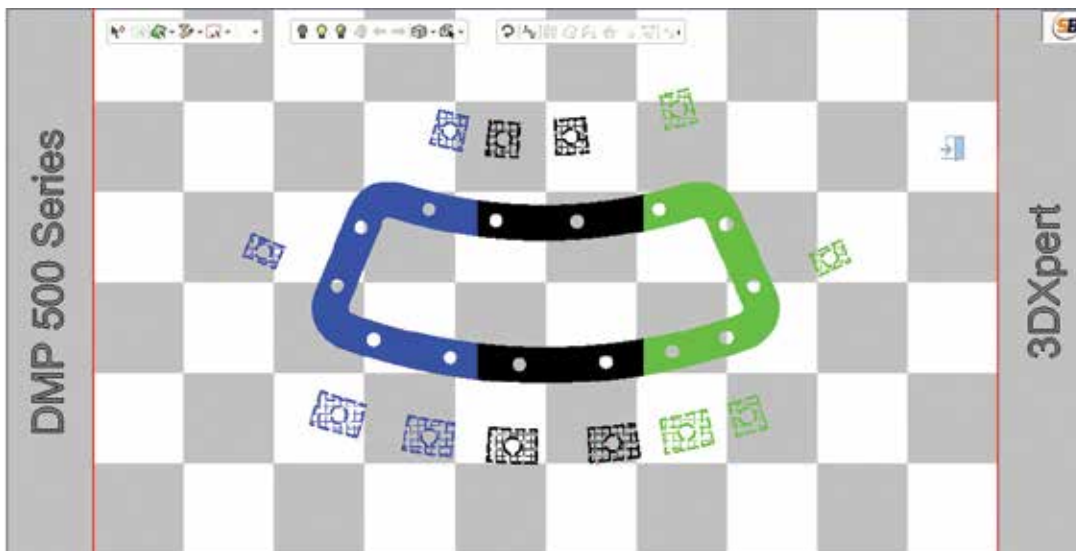
Multi-Head assignment tool on DMP Factory 500

Plate Management and Mini Pallets

## Supporting serial production for downstream processes

For hybrid manufacturing processes where additive manufacturing is followed by downstream post-processing (for example, milling), there are many challenges that originate from the need to have unified position and orientation reference systems, and the ability to mobilize the part from one platform to another using robotics. The 3DXpert plate management and mini pallet solution is an important enabler to support these hybrid workflows in serial production.

CHALLENGE:

Manage several mini pallets that may have different sizes and hold different parts while providing the full tool set of part preparation per pallet for a successful print.

SOLUTION:

The plate management and mini pallets solution is a strong indication of 3DXpert's versatile and unique capability to support and solve actual manufacturing challenges. Mini pallets are positioned on a master plate which connects to the machine tray. Often a single part is printed on each mini-pallet. After printing, each pallet can be moved to the next post-processing station. Modern docking systems allow for coordinate systems to be set in a robust and stable way. 3DXpert executes the full set of part preparation operations and workflow within the scope of each mini pallet. 3DXpert currently supports two catalogs of mini pallets. Custom sets of mini pallets can be prepared to suit your needs.
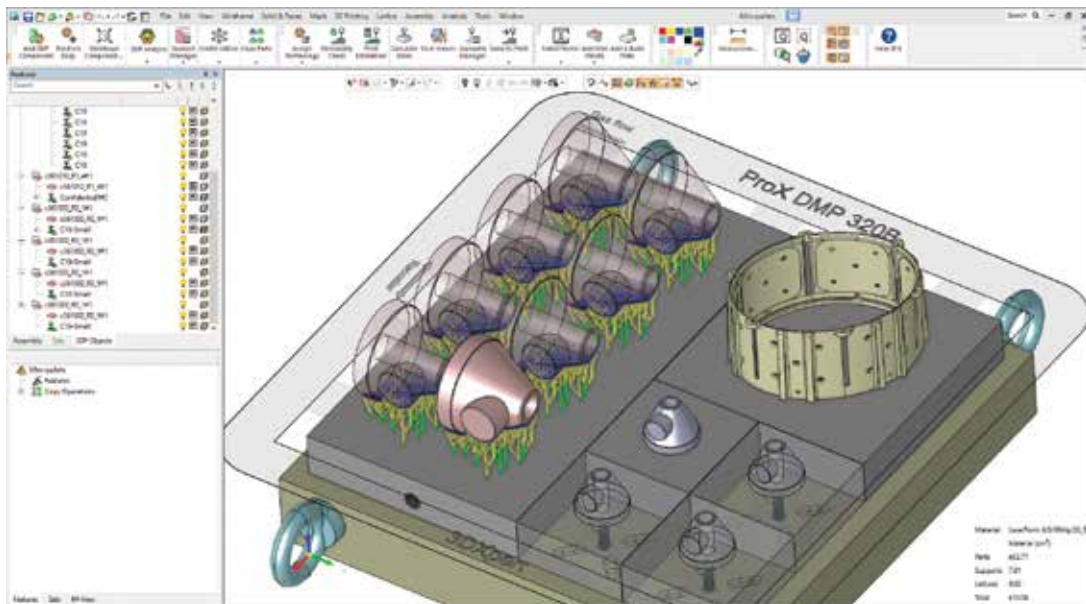
Mini pallets sample with single and multiple parts for supporting downstream processes

Power Support

## Automated support type to fit all applications

Many printing technologies require support generation which can be a tedious and time-consuming task. Correctly supporting the part impacts print success, surface quality, and post-processing time and cost.

CHALLENGE:

Automatically generating adequate support structures and placing them correctly.

SOLUTION:

The new power supports feature allows full automation of the support generation process for different geometries, while maintaining a high level of optional manual control. Lattice-like or tree-like supports grow from the part geometry down to the build plate with the click of a button. These new support structures automatically keep their distance from the part geometry to make removal easier, while gusset connections are used to shorten connector length where relevant.
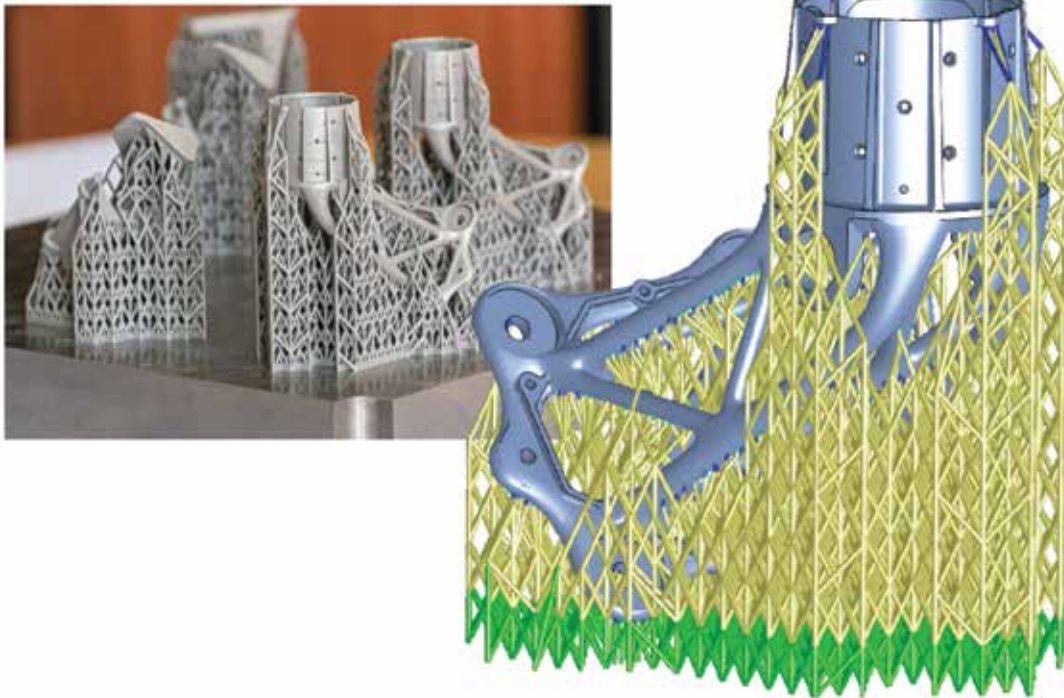
Power Support assigned to an industrial part

Build Simulation Enhancements
Improved accuracy and usability

Build simulation helps boost the success rate of prints that meet dimension and tolerance specifications, optimize the design, and minimize the number of tryouts. Integrated within the design environment, build simulation provides immediate feedback on print preparation decisions, including orientation, amount of supports (both too few and too many) and their layout, and part printability. This is of particular importance when printing costly or large-volume parts.

CHALLENGE:
Enhance simulation accuracy and provide clear insights.

SOLUTION:
Several enhancements were introduced in 3DXpert 16.

One of those improvements was made in regards to generation of compensated models (the geometry to be printed, compensating deviations, to achieve the target dimensions). It is now possible to create a separate compensated object for each simulated object, for example, supports and lattice. Each compensated object maintains attributes and print strategies assigned to the original model, enhancing printing quality.
A new option to use different calibration for different printing strategies is now available; this allows the simulation to provide more accurate results.

Another improvement to simulation precision is the new automatic element size recommendation that ensures capturing small features to be included in the simulation.
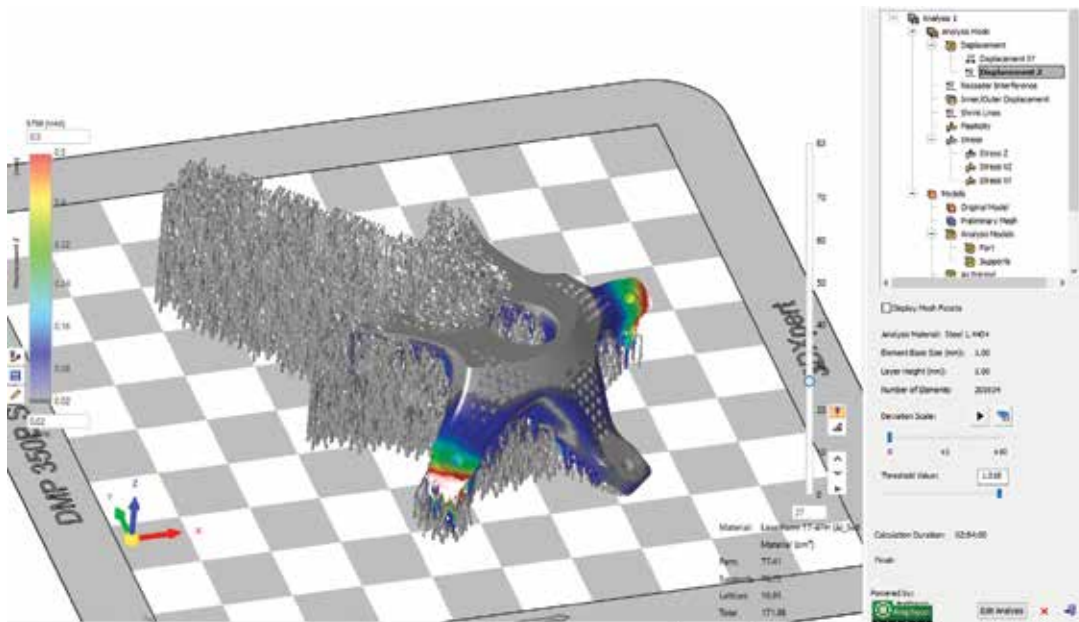
Build simulation – visualization of the displacement on Z-axis

Lattice Design Enhancements
New types, customizations, and analysis capabilities

Lattice structures are an essential part of DfAM solutions. They enables endless freedom of design to meet functional requirements. Creating and assigning lattice structures to existing geometries can turn into a time-consuming task that requires experience and knowhow. Additionally, due to their geometric and visualization complexity, they can impact the size and performance of the model file. 3DXpert introduces a best-in-class lattice solution with powerful capabilities and performance.

CHALLENGE:
Easily define and assign the best lattice structure for its functional purpose, while making sure the newly designed part meets all functional requirements and is printable.

SOLUTION:
The new lattice enhancements in 3DXpert 16 extend lattice capabilities and support more applications and use cases with special focus on industrial, healthcare and consumer goods applications.

This version includes many improvements across the entire lattice solution, starting with the introduction of a new conformal lattice that follows the bounding faces of an object, and continuing with the addition of pore size analysis to our lattice analytics tool, new force definitions and performance improvements to the lattice FEA tool, and many more small improvements that elevate the overall usability. This new package of lattice enhancements delivers valuable capabilities for applications such as medical devices for improved porosity, light-weighting aerospace parts, and power applications such as turbine blades and heat exchange.
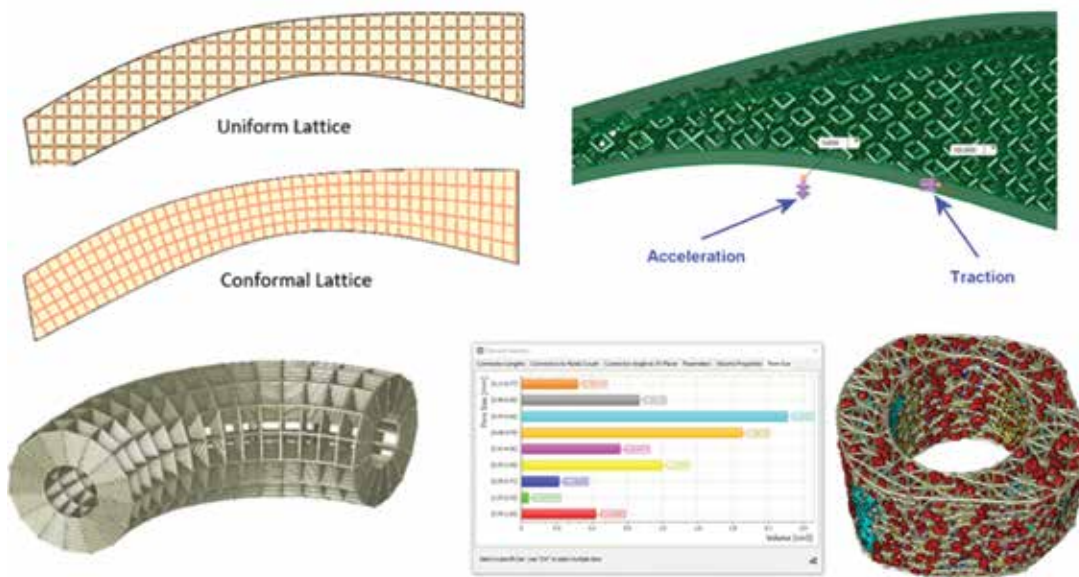
Conformal lattice, new forces FEA analysis, pores size analysis, and circular lattice

3D SYSTEMS

3D Zoning Enhancements
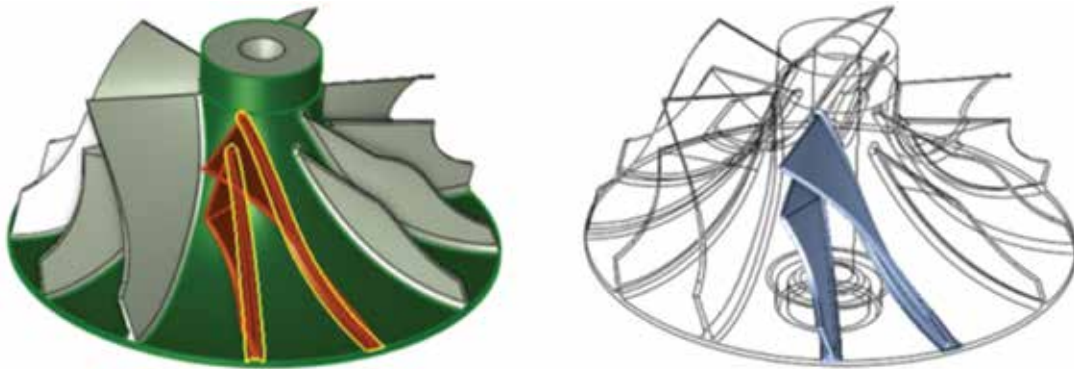## Simple creation of virtual object on complex geometry

3D zoning is a unique 3DXpert solution that enables assigning a different printing strategy to a portion of a part without separating it into different objects. This capability is valuable when there is a need to achieve specific surface quality, material density, or performance on specific volumes such as thin/narrow areas, holes, etc. 3D zoning technology utilizes virtual objects to assign the different printing strategies.

CHALLENGE:

Reduce the effort and expertise required to create virtual objects, especially when facing challenging geometries.

SOLUTION:

Introducing new tools that make it easy to define a virtual object for non-CAD users and enable automatic multiple volume recognition around any geometry, regardless of its shape and complexity. This is a significant time saving tool.

Creation of virtual objects around thin blades

SLS Print-Prep Enhancements

A complete tool set for successful printing in SLS

SLS technology has its own unique challenges and requirements for successful and high-quality printing of parts. Issues like Z-compensation, 3D nesting, and efficient slicing are critical for the process and need to be handled automatically and in the most optimal way.

CHALLENGE:

Successfully manage and produce high quality SLS parts of all shapes, sizes, and types while reducing part preparation work to a minimum and optimizing build time efficiency.

SOLUTION:

SLS part preparation was significantly enhanced with the addition of new tools such as the automatic Z-compensation tool that modifies the part geometry to compensate for overheating of lower layers under down facing areas to produce a correct and high accuracy part every time. The new slice area analysis is a graph that presents the printed area of each layer along the Z-axis. It helps users analyze the printing duration of layers throughout the height of the tray, to make sure there are not great disparities between them so that overheating doesn't occur. The 3D nesting tool now includes the full rotation option that delivers a higher packing rate.

With 3DXpert, it is possible to select and use validated materials and privately developed materials for direct printing on the ProX SLS 6100 printer and to export (send to print) the scanpath to ProX SLS 6100's native format (BPZ).
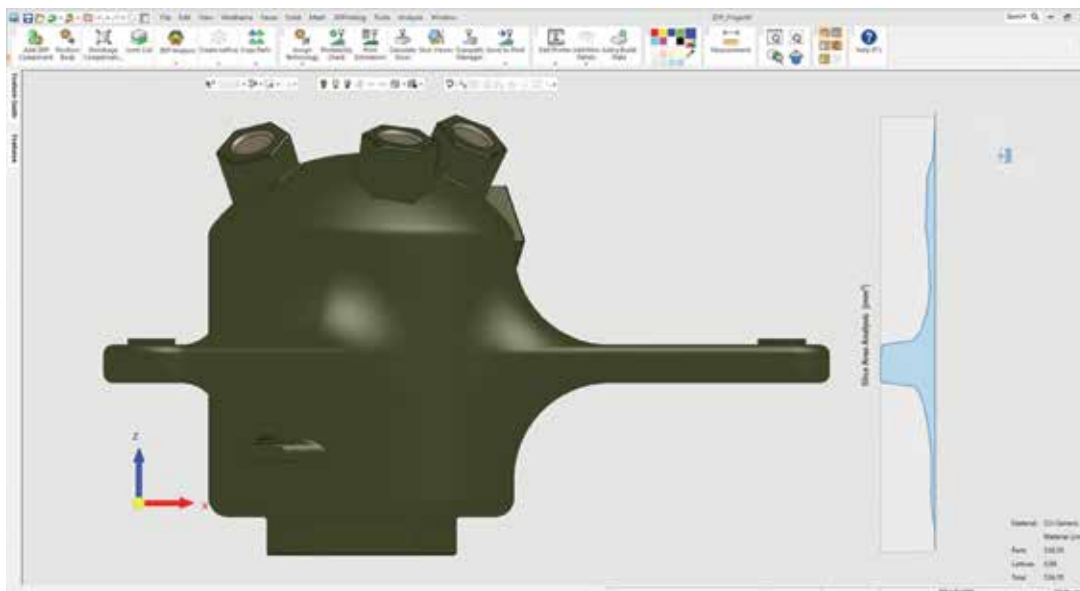
New slice area analysis tool

Automatic Dental Workflow

A simple one-click solution for metal dental applications

Digital dentistry requires the use of dedicated software solutions to support the capture, design, and manufacturing of dental data using AM technologies. A simple-to-use, automatic solution helps shorten time to manufacturing and increases the ROI of the entire process.

CHALLENGE:

Make the metal dental AM process more accessible and easy to use by introducing automatic dental workflows for designing, preparing and printing dental applications such as crowns, bridges, RPD and implant bars.

SOLUTION:

3DXpert 16 introduces a new automated dental workflow functionality that reduces up to 50% of part preparation time and increases productivity. The dental workflow includes automatic part classification and orientation, automatic assignment of support templates per part classification, nesting and auto-detachable labeling. The automatic dental workflow settings can be managed and customized per the required use case.

The automatic dental workflow is now available for all metal printers that are supported by 3DXpert.
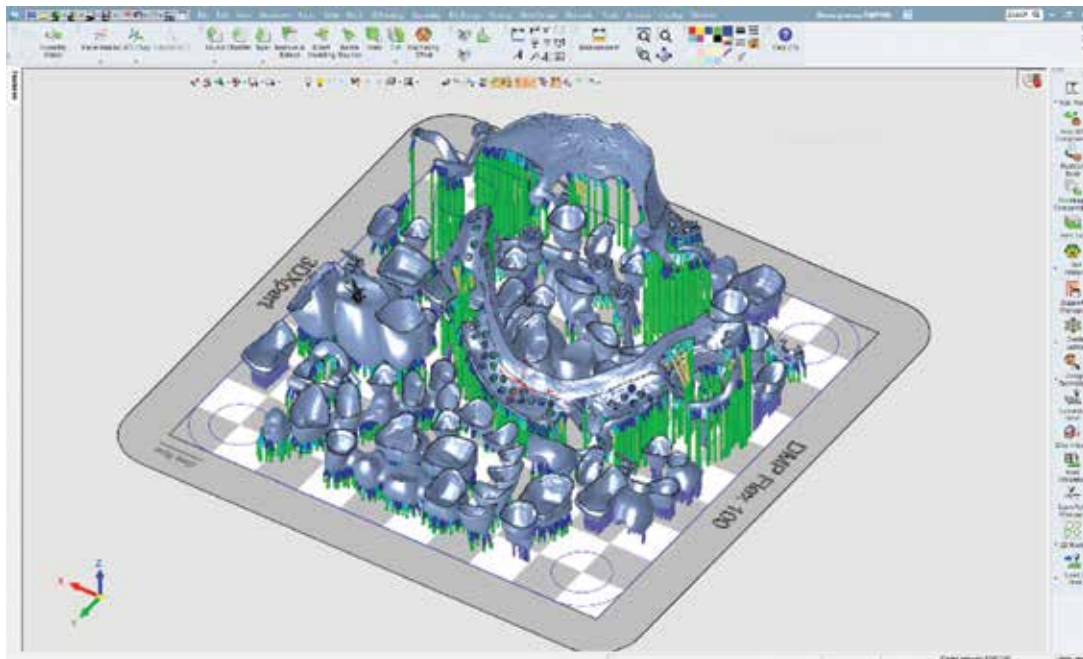
Automatic one-click solution for printing metal dental applications

Automation and Scripting
## Enabling automation and customization of AM design workflows

The successful printing of parts requires expertise, experience, and precision. The knowhow gathered through diligent experimentation and innovation can now be incorporated into additive manufacturing workflows. Scripting is a tool that enables automation of workflows, simplification of the design and preparation process, and standardization to meet compliance and validation processes.

CHALLENGE:

Simplify the process of designing, preparing, and printing AM parts. Preserve and automate learned expertise and knowhow of repeatable workflows to make the process more accessible to novice users, and reduce engineering costs of design and preparation.

SOLUTION:

3DXpert 16 introduces a new scripting functionality that enables automation and customization of any workflow in 3DXpert. It is based on a non-programming interface for the simple definition and implementation of scripts. Scripting and workflow automation are key in standardizing work processes, which can streamline compliance and validation procedures. Cost savings come from automating repetitive tasks as well as from preventing user errors and operations that deviate from best practices.
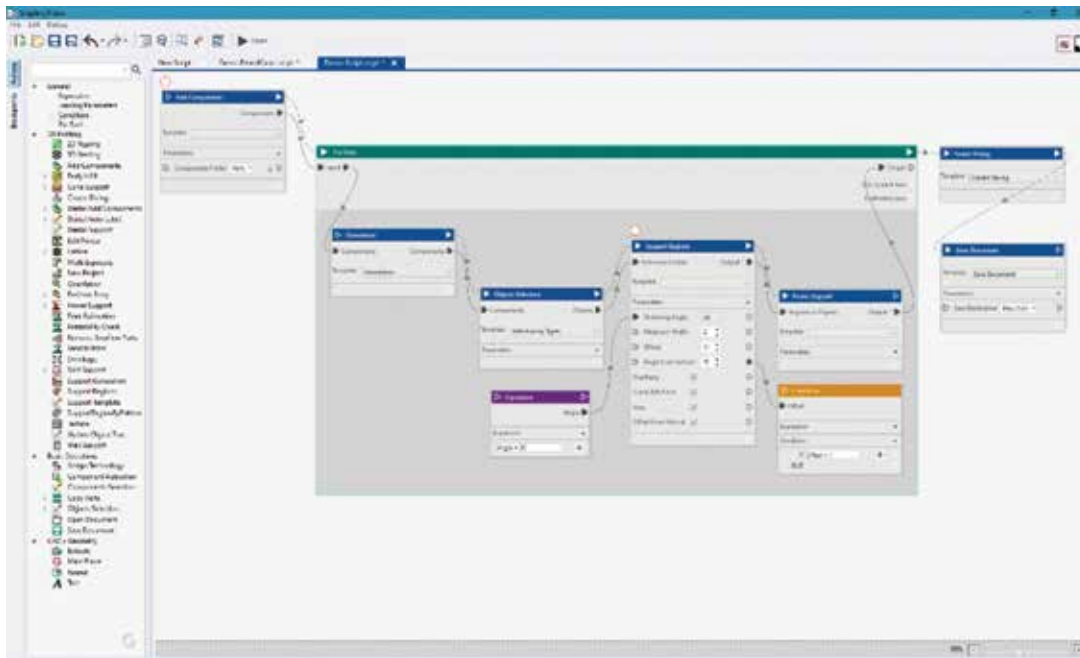
New 3DXpert Scripting Editor for automation of AM workflows

Note: Scripting is released to customers with Ultimate or Professional licenses, under special provisions. If you are interested in receiving it, contact your local reseller.

3D SYSTEMS

DMP Inspection

Automated detection and visualization of potential AM quality defects

A validated AM process is one of the key factors for having repeatable and sustainable printing. It creates confidence that the quality and mechanical properties of the printed parts correspond to the design specifications. The common practice today to qualify the AM process is based on post-build tests like CT scans and other destructive tests. These processes are costly and time consuming, require intensive manual work and expertise, and can be challenging when it comes to serial production.

CHALLENGE:

Automatically inspect all printed parts regardless of their size and quantity, detect and easily visualize potential defects, execute a root cause analysis, and take corrective actions.

SOLUTION:

DMP Inspection™ is an automated post-build analysis that can provide a quick initial indication of the overall quality of the printed part. DMP Monitoring, available with 3D Systems' ProX® DMP 350 and legacy ProX® DMP 320, collects an immense amount of data during each print. This data includes a multitude of visual data taken during the printing process and data collected from light emission sensors within the printing chamber.

DMP Inspection reads the data collected by the monitoring systems and analyzes it to detect anomalies that can indicate the existence of defects like lack of fusion, porosity, dross on down facing areas, warpage, powder deposition, and more. Any discovered defects are visualized side by side with the design model. Build inspection is a valuable tool for use cases such as machine diagnostics, new material development, and design validation. In part acceptance use cases, the tool can be used as an early indication quality tool, in addition to the existing quality assurance process. Analysis, detection, and visualization are all done within the 3DXpert platform, enabling a true root-cause-analysis workflow.
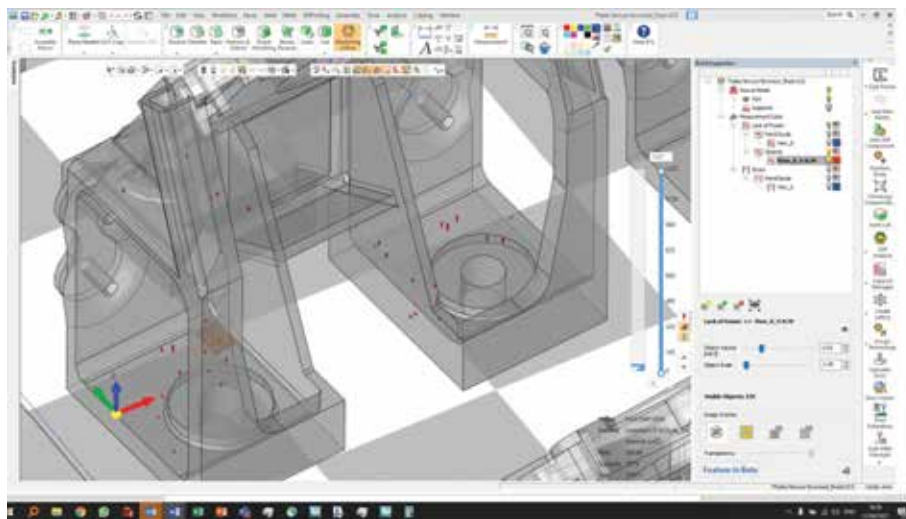
DMP Inspection – 3D visualization of lack of fusion porosity events

Note: DMP Inspection is released under special provisions. If you are interested in receiving it, contact your local reseller.

Find out more at: 3dsystems.com/software/3dxpert