



3DXpert

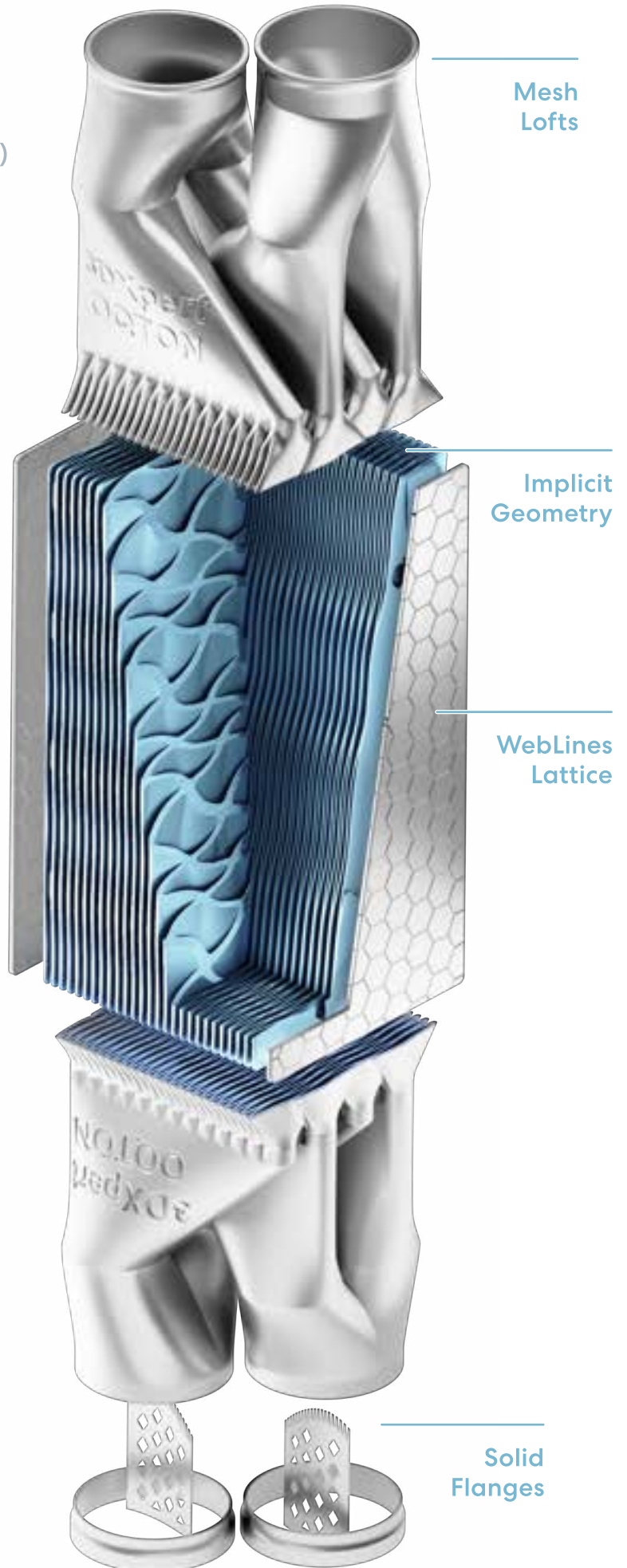
Design for Additive Manufacturing (DfAM)

Optimize design and manufacturability in a single integrated CAD environment.

Maximize efficiency and innovation with advanced, end-to-end DfAM and build prep capabilities for the design and printing of industrial parts.

3DXpert enables freedom of design for designers looking to take advantage of additive manufacturing capabilities, while maintaining functional requirements.

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Lightweighting with topology optimization

Topology optimization achieves lightweighting by changing the shape of a part, using FEA to remove material in an iterative process that delivers the lightest possible part whilst maintaining critical functional requirements like strength and stiffness.

With 3DXpert, each iteration removes more and more material until achieving an optimal design.

The 3DXpert process

1. Define structure and functional constraints
2. Add Manufacturing constraints
3. Confirm material and stock

Working within the 3DXpert build-prep environment enables you to account for physical and functional properties, manufacturability, and cost by:

- Exploring different use cases
- Trying out different scenarios
- Testing ideas and comparing results
- Considering supports, material usage, and print time



The evolution of a part, from the first iteration to the optimized lightweighted version.

Why 3DXpert?

- Smooth, high-quality results without ragged edges
- Easily transformable into a b-rep or solid model
- Optimizes for multiple manufacturability factors
- Powerful performance delivers more scenarios per iteration

Lightweighting with internal structures

Lightweighting can also be achieved by hollowing out space from the part and filling that space with internal structures, including strut-based lattices, infills and TPMS (Triply Periodic Minimal Surfaces).



Strut-based lattices are a regular arrangement of unit cells constructed from struts and nodes in a basic “building block” design. The unit cell is propagated along the X, Y, and Z axes. Various arrangements of struts and nodes influence stiffness, deformation, and failure.

3DXpert allows you to use a multitude of predefined cell structures and strut and node shapes. Define your own cell structures and use any shape for your strut profile or node shape.



TPMS lattices can be skeletal or sheet-based. These unique porous structures are made of continuously curved, self-supporting geometries that eliminate stress concentrations. 3DXpert allows you to precisely tailor design, density, and other properties to optimize lightweighting.

Infills are based on a profile that is extruded upwards along the printing direction. While they are limited in terms of load and stress mitigation, these simple structures are frequently used in hollowed out spaces when more complex structures are not required.

Weblines are external ribs that achieve a similar goal to internal structures, enabling you to make part walls thinner while maintaining structural integrity.

Why 3DXpert?

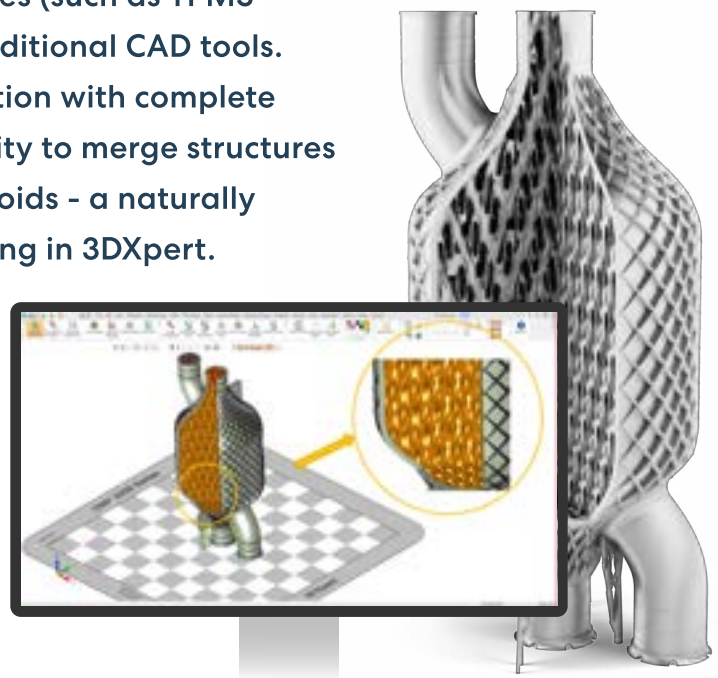
- Creates structures within the printing environment to ensure manufacturability
- Allows high-speed creation, editing, and visual manipulation of lattices
- Provides convenient history-based parametric features
- Includes a rich library of pre-defined lattice structures
- Optimizes lattices with FEA stress analysis

Beyond CAD: The power of implicit modeling

Implicit modeling describes complex geometries (such as TPMS lattices) that are impossible to design with traditional CAD tools. Experience true freedom for structural innovation with complete control over all parameters, including the ability to merge structures easily. One example of such structures are gyroids - a naturally inspired structure created with implicit modeling in 3DXpert.

Gyroids offer unique thermomechanical properties that are extremely valuable in automotive, aerospace, and many other industries, including:

- High stiffness-to-mass ratio
- High energy absorption
- Efficient heat transfer



Function-based structures combine TPMS lattices and DfAM to minimize weight while maximizing surface area. These structures use surface textures based on various mathematical functions, opening up expansive opportunities to manipulate cell size, thickness, and other parameters.

Dedicated Application: Heat exchangers

Heat exchangers are one of the most exciting applications of function-based structures. Lightweight construction and a huge surface area enable highly efficient operation.

With 3DXpert, implicit modeling generates complex TPMS structures that are inherently divided into separate volumes for hot and cold fluid. Specifically, 3DXpert's Heat Exchanger application enables you to:

- Create inlets and outlets with automatic plug generation for each medium
- Generate complex arrays of channels for direct feed of the TPMS structure
- Estimate the efficiency coefficient with analysis tools
- Iterate quickly to explore various options until achieving the desired result



Put the “M” in DfAM to ensure manufacturability

Leveraging DfAM techniques can help you create innovative, highly efficient parts — but the printability of those parts is never a given.

DfAM models are typically moved into a separate application for build prep, creating unnecessary risks. Data integrity is easily compromised in this process. Moving the wrong file version can be a costly mistake. And for complex structures with millions of cells, there is no guarantee that the build prep software will be able to open the model or represent it accurately.

This is what makes 3DXpert so valuable for DfAM. It offers a single, fully integrated experience that empowers you to design and print in an environment optimized for additive manufacturing. That means direct calculation of build preparation without the need for data transfer or conversion.

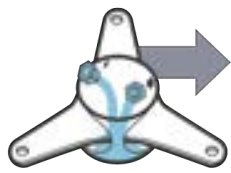


Taking AM into consideration

3DXpert includes all the capabilities you need to make sure DfAM parts are printable and optimized for AM:

- Determine the number and type of supports for both metal and topology optimized parts
- Regenerate strut-based lattices automatically as part orientation changes
- Support or remove dangling geometry in complex structures
- Assist with powder removal using drain holes and pore size analysis

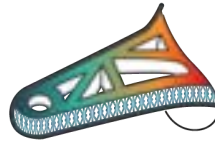
3DXpert: One environment for DfAM and build prep workflow



Import Data



Position and Modify



Light Weight

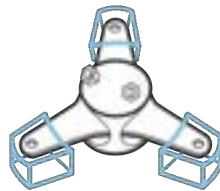
DFAM



Create Support



Simulate Build

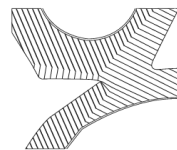


Setting Printing Strategies

PREPARE



Arrange Build Platform



Calculate Scan-Path



Stabilize Thermal Behavior

MANUFACTURE

3DXpert is your one-stop-shop for additive manufacturing.

Streamline your workflow, maximize efficiency, and avoid costly errors, by completing all AM processes in the same software environment, including DfAM, build preparation, simulation, and inspection.

Take the next step

Request a free trial at
Oqton.com/3DXpert