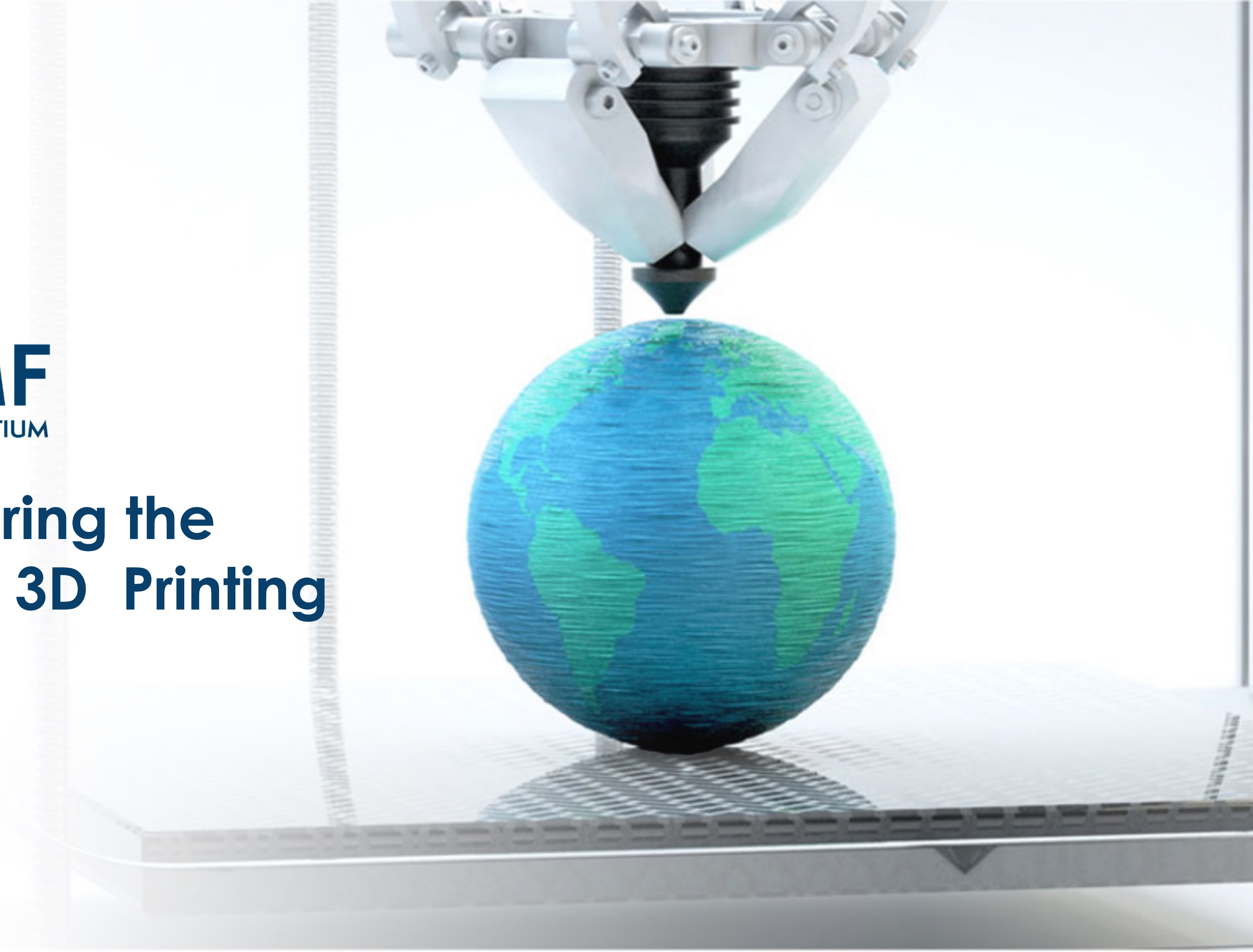




Empowering the Future of 3D Printing



Executive Director's Message

Additive Manufacturing promises many advantages, from the lower cost of prototyping and equipment to faster production and the ability to combine components into one part, not to mention the ability to support AI-driven design. Taking full advantage of these benefits is highly dependent on the 3D file format used to communicate designs to printers. Legacy file formats have limitations as to what information is communicated to the printer resulting in multiple iterations of prototypes, wasted time and materials, and slower time to market for products.

The good news is that the 3D Printing and AM industries have come together to define an open-source file format that allows for precise communication between the designer and the 3D printer.

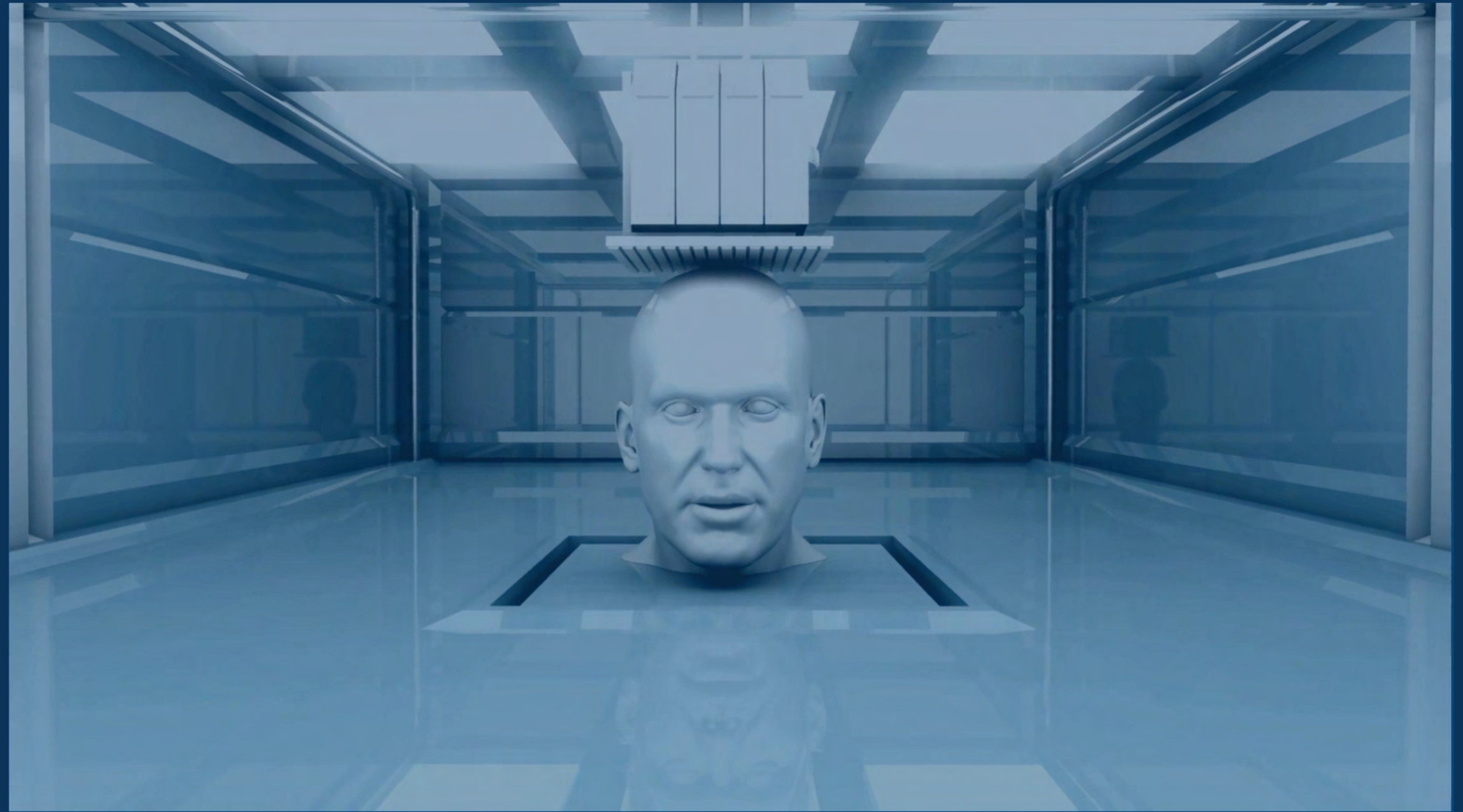
I invite you all to explore the advantages of the 3MF specification and start realizing the full potential of 3D Printing.

Luis Baldez, Executive Director, 3MF



Why 3D Printing?

- Efficiency/automation
- Design freedom
- Production flexibility
- Improved sustainability
- Federated/onsite printing



The print format is a critical element in realizing this vision.

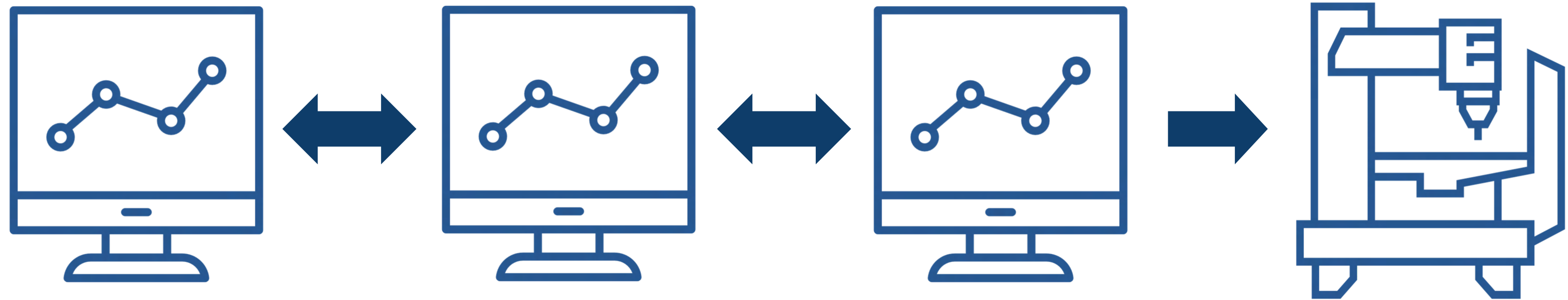

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Understanding 3D printing data formats

Print format uses

Software – software communication

Software – hardware communication



- The print format is the key tool for communication between the software systems and the manufacturing equipment on the factory floor.
- The very best printers can only print what can be communicated based on the completeness and accuracy of the 3D print format.

Legacy



Traditional print formats such as STL leave out vital information about

- color
- materials
- topology
- connectivity
- units

This leaves room for critical miscommunication that can cost time, money, and resources.

The reality of legacy 3D printing standards falls short of the vision.

A close-up, blue-tinted photograph of a 3D printer's extruder head. The head is positioned directly above a stack of printed parts, which appear to be thin, layered sheets of material. The printer's frame and various mechanical components are visible in the background, creating a sense of depth and industrial precision.

Why the industry
is embracing 3MF



Industry Driven

3MF stands for “3D Manufacturing Format” and the specification is the most complete 3D print format available.

The format allows design applications to send full-fidelity 3D models to a mix of other applications, platforms, services, and printers.

And as a part of the **Linux Foundation**, it is **open source** so that the entire additive manufacturing ecosystem can take advantage of specifications for their products and services, as well as participate in defining the specification.



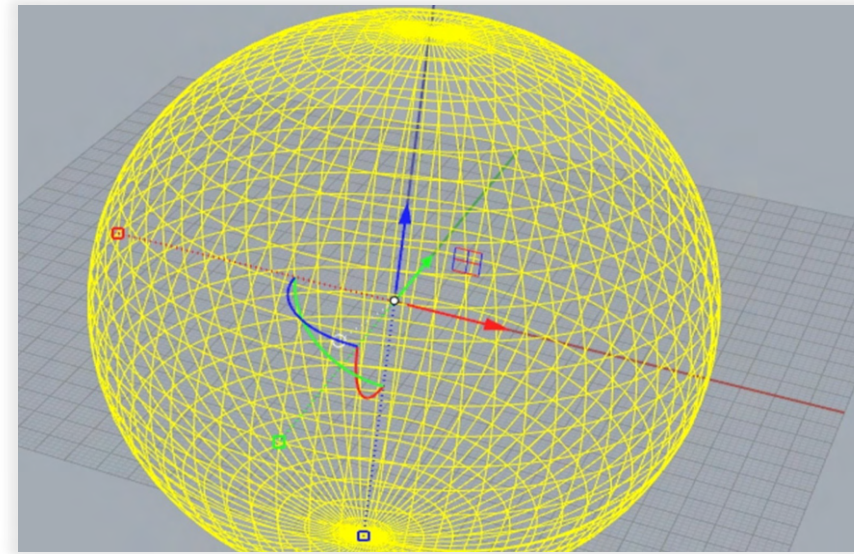
The Core of the 3D Printing Industry



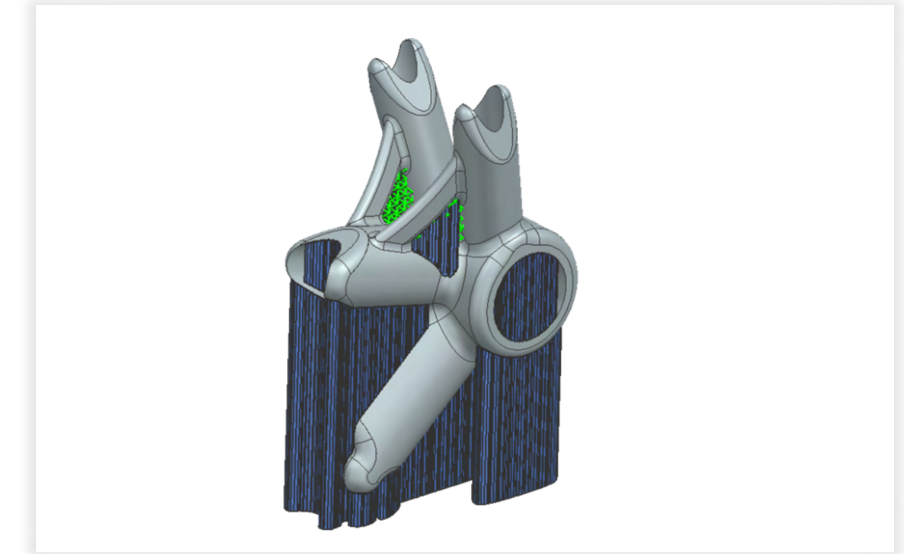
Benefits



Send color model to a print service



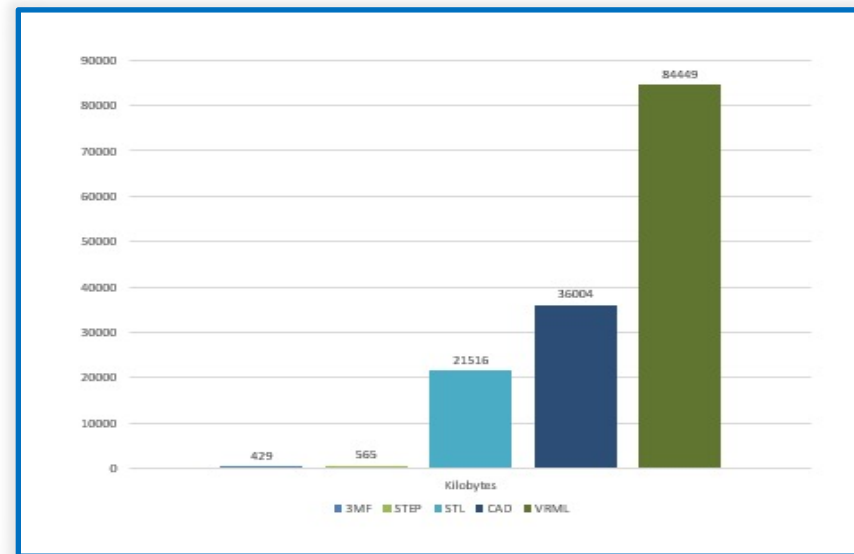
Print complex geometries, specific sizes and dimensions



Include support structures with model



Security and traceability



Reduce file size

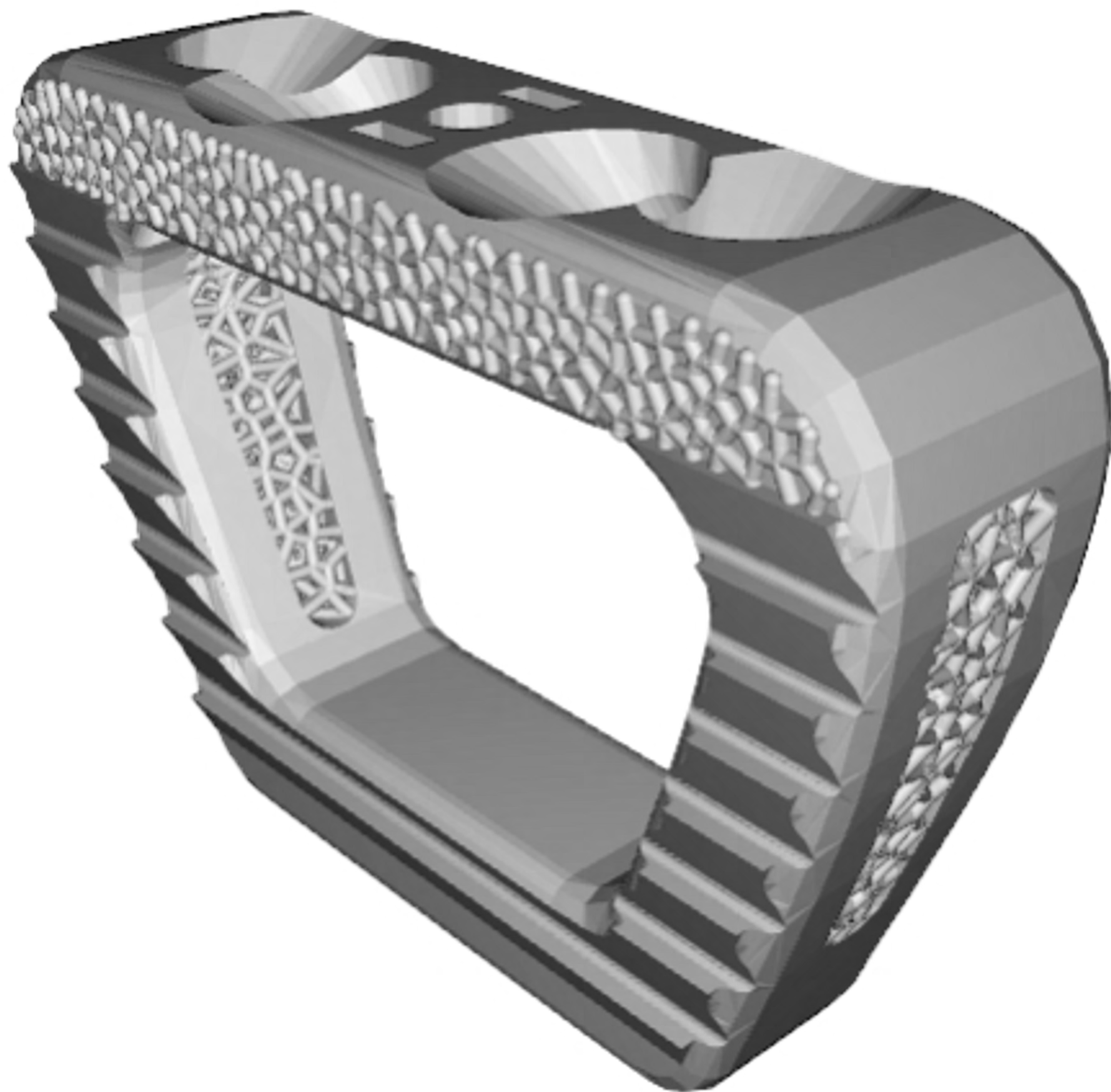


Assign materials

How does this help me or my customers?



Designers	Service Bureaus	Brands
Truest representation of your designs. Specify material, color, size, and shape.	Quality. 3MF delivers product that is the most accurate with the least margin or error	True to brand. 3MF delivers your brand's shape, size, and color
Wide availability. Every major CAD software vendor is part of 3MF.	Fast new product prototypes! Reduce back and forth with the designer, multiple iterations and guesswork.	Security features to protect your IP and your brand's reputation. With built-in encryption, traceability, and licensing information
Broadest interoperability across the value chain from CAD tools to printing equipment.	Save money on materials and labor through reduced file errors, uncertainties, and do-overs + lower storage costs.	Built-in quality checks to ensure your products are printed to specification without error.



Case Studies

Priority Designs, Stratasys & Luxion



Stratasys keyshot 10

Bluetooth speakers featuring advanced simulation textures produced by Priority Designs on Stratasys' full-color 3D printing technology using KeyShot 10 software.

“ 3MF was actually the enabler because the special thing about it is that it doesn't just hold the geometry, but also the color, the materials and finish. You have much more information in one package. ”

-Michal Diga, Director of PolyJet Software Solutions at **Stratasys**



Unlimited Tomorrow, HP & Siemens



Patients can select from hundreds of skin tones for their new prosthetic to be printed in.

Companies like Unlimited Tomorrow, rely upon 3MF to send accurate data about color to the printer so their patients have prosthetics that represent their natural skin tones and their personalities.



The background of the slide is a complex, abstract geometric composition. It features a central, dense cluster of overlapping triangles in various shades of yellow and gold. These triangles are arranged in a way that creates a sense of depth and movement, as if they are floating or exploding from a central point. The overall effect is one of dynamic energy and futuristic design.

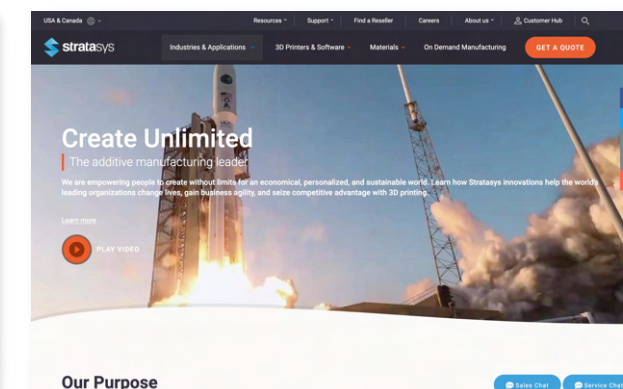
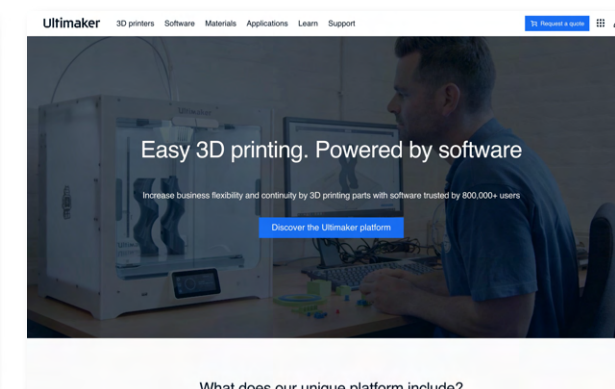
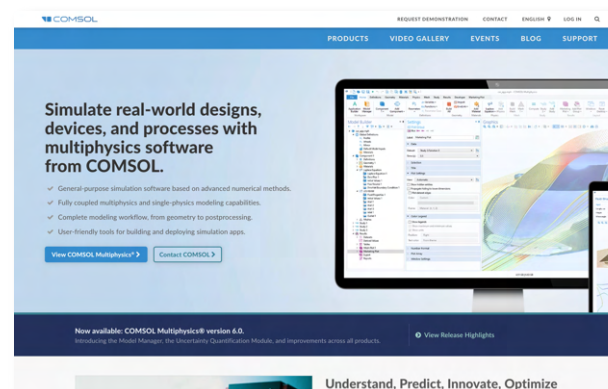
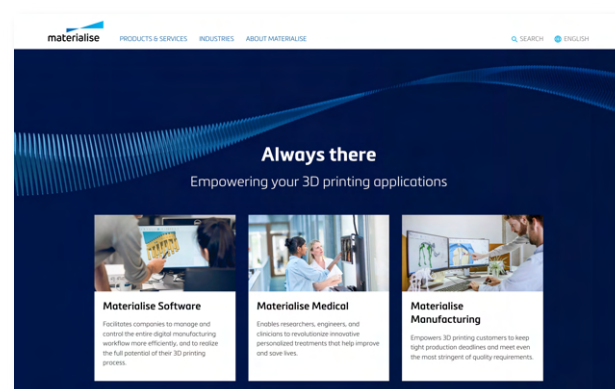
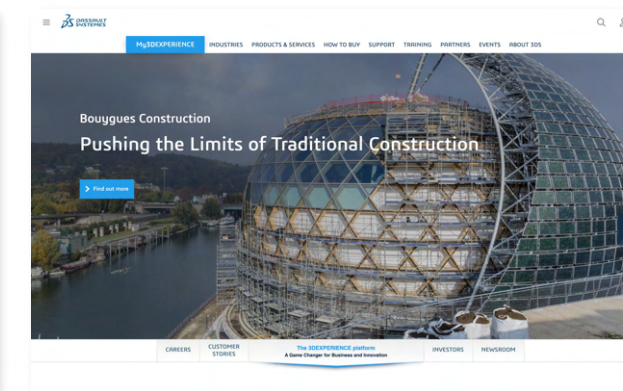
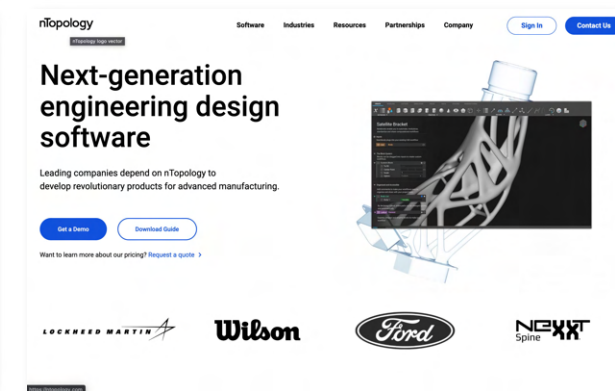
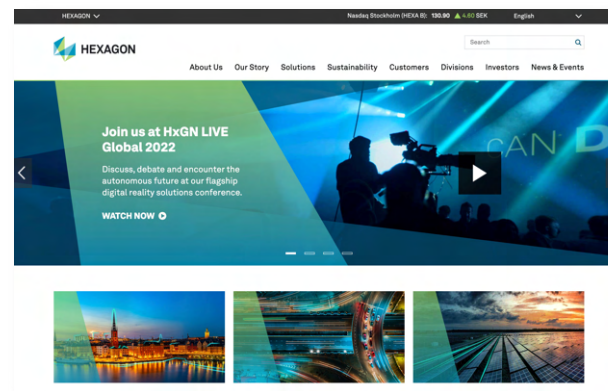
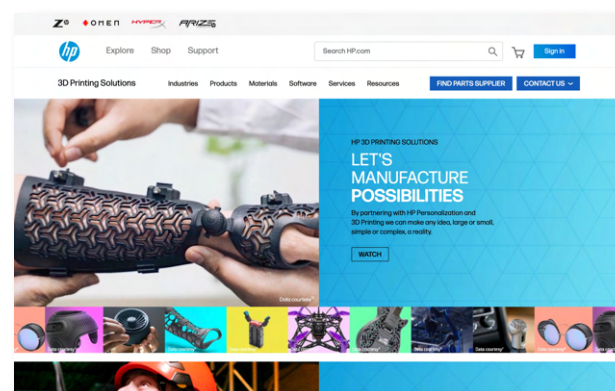
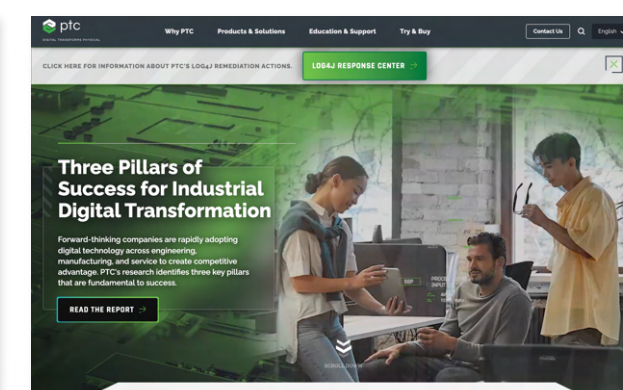
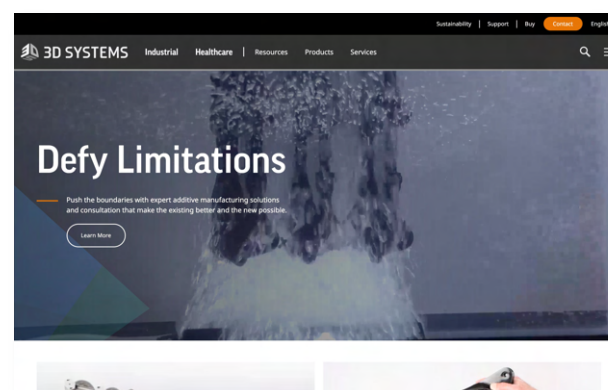
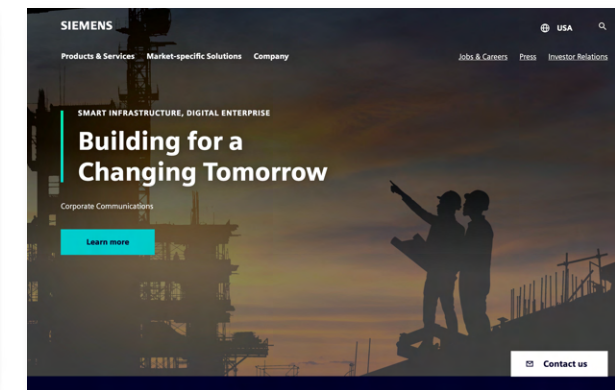
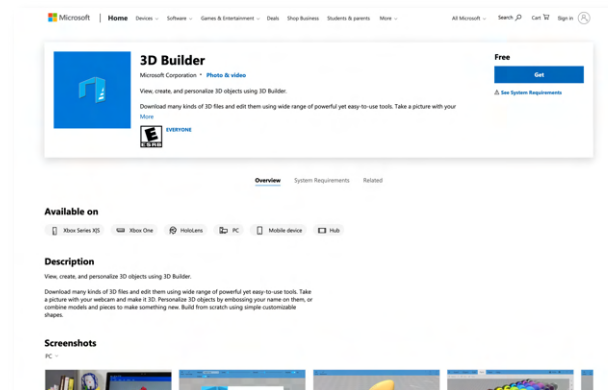
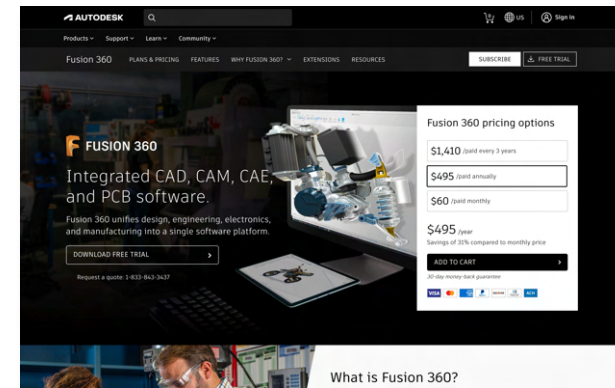
Driving the Future

Adoption

Across the ecosystem, software and manufacturing equipment manufacturers are deploying products using the 3MF specification and extensions.

Over 40 products available!

See the full list at <https://3mf.io/adoption>



Resources

Use these free, open-source resources in your products and services.

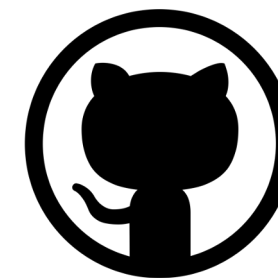
Or

Join us today to help drive the future of additive manufacturing!



<https://3mf.io/specification/>

<https://3mf.io/membership/>



<https://github.com/3mfconsortium>



Thank You

info@3mf.org



Backup

Extension Details

3MF Extensions Overview

3MF extensions are essential to keeping up with the developments of the industry and enabling specific use cases.

The 3MF Consortium has developed the following extensions so far:

- 3MF Core Specification (2015)
- 3MF Materials Extension (2015)
- 3MF Slice Extension (2016)
- 3MF Production Extension (2016)
- 3MF Beam Lattice Extension (2018)
- 3MF Secure Extension (2020)
- 3MF Beam Lattice Ball Extension (2021)
- 3MF Volumetric Extension (2021)

Materials Extension

- Enables the use of one or more textures and/or materials in a printed part
- Allows for multiple colors to be used for one or more printed parts
- Makes it simple for manufacturers to combine multiple properties
- Realistic preview of the print outcome using the glTF physically based rendering standard



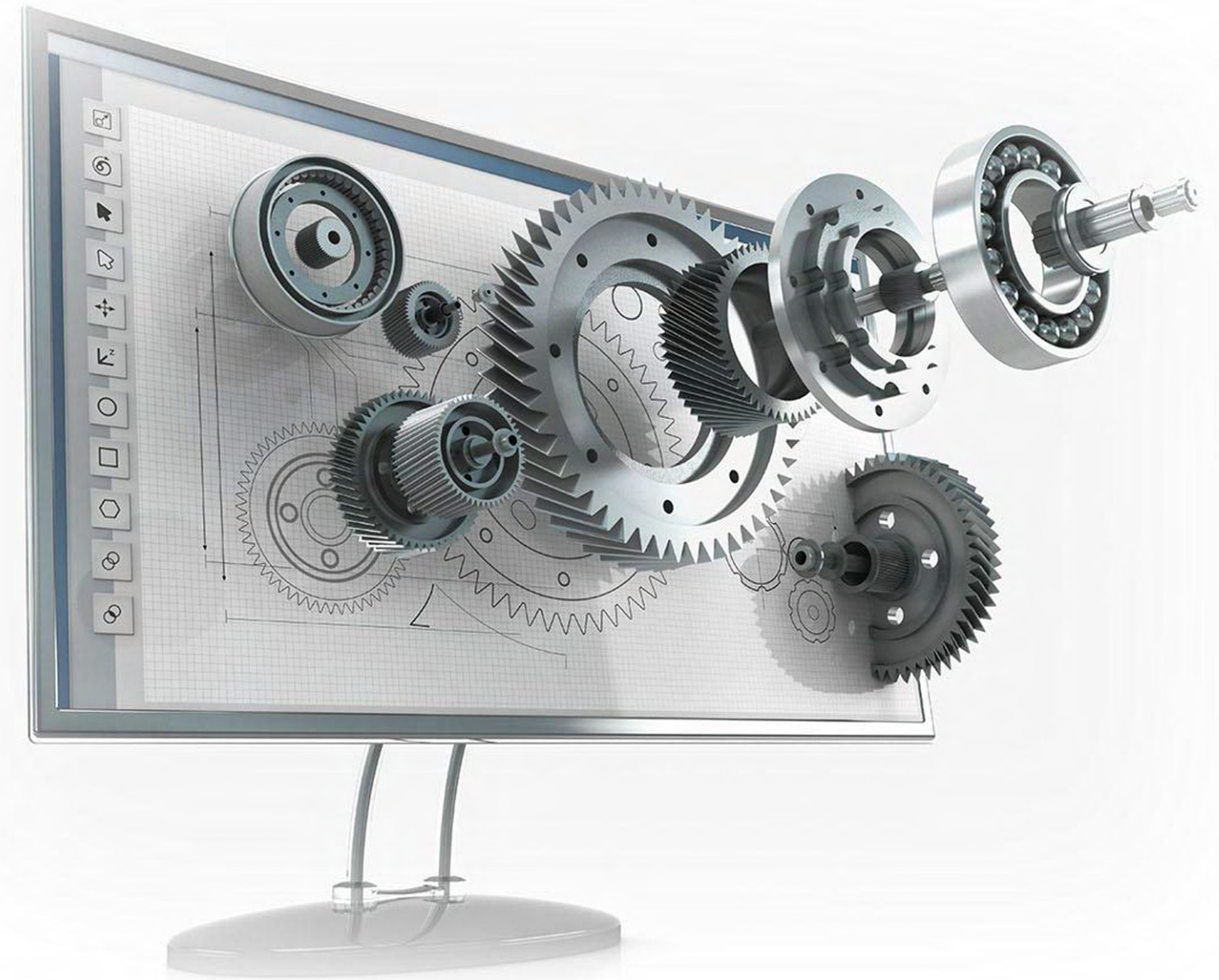
Slice Extension

- Provides a single, standardized format for defining layered geometry data
- Enables high model complexity with manageable file size
- Simplifies the printing process processes for manufacturers
- Ensures that the data needed to print is readily understandable and consistent



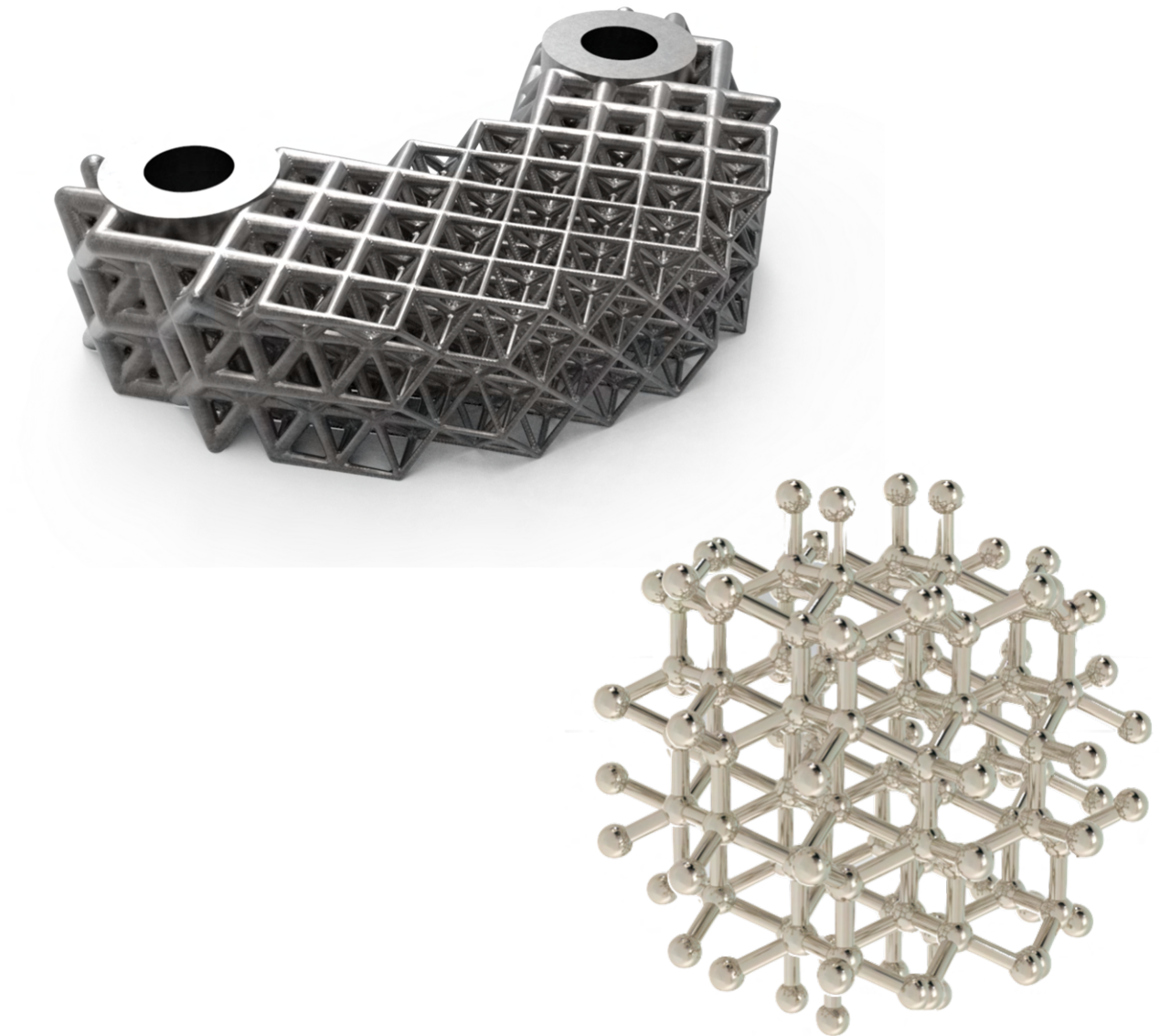
Production Extension

- Designed for high-volume users such as service bureaus
- Makes it more efficient for users to organize and manage print jobs with multiple parts
- Keeps parts in separate .xml files within the 3MF package
- Divides the parsing load for large printing jobs
- Manages the file hierarchy and relationships among the files
- Keeps unique identifiers for each part instance
- Tray rearrangement is possible without reencoding the geometry data



Beam Lattice Extension

- Designed for storing and transferring lattice-type geometry information
- Efficient encoding and reduced file sizes for lattices
- Solves an interoperability issue for the additive manufacturing industry, providing a solution not found in other file formats
- Enables multi-product workflows
- Ball update added in 2021
 - Ability for designers to specify balls at intersections or joints



Secure Extension

- Designed for securely encrypting resources within a 3MF package
- Enable 3MF producers to control which consumers have access to the confidential content
- 'Two-level' Key Encryption Key - Content Encryption Key (KEK-CEK) wrapping scheme
- A trusted public key exchange is outside of this specification and needs to be handled by the specific ecosystem
- Typical use cases include protection of sensitive information, regulatory compliance, archiving



Volumetric Extension

- Enables designers to add new types of elements to their designs and manufacturers to prototype faster.
- Provides an efficient approach to encode geometrical shapes and spatial properties that are based on a volume-based description.
- Communicates color and transparency gradients, objects inside objects, color and materials distribution and composition of object variation.

