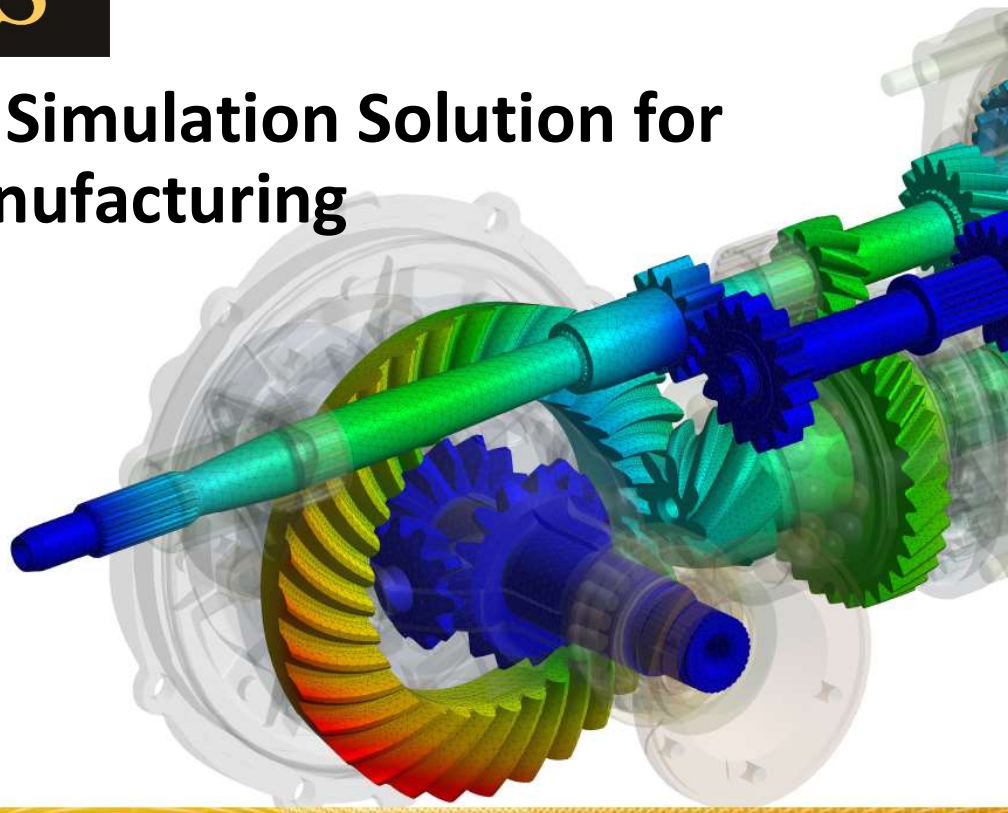
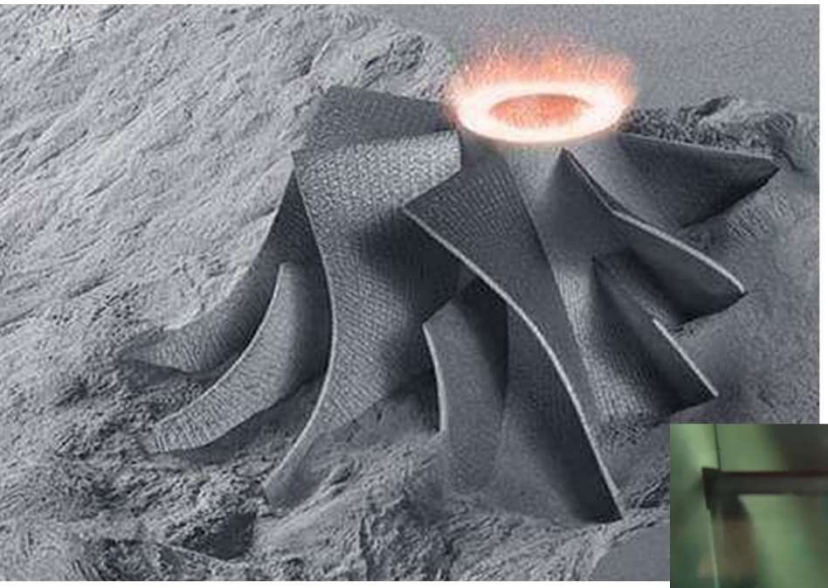
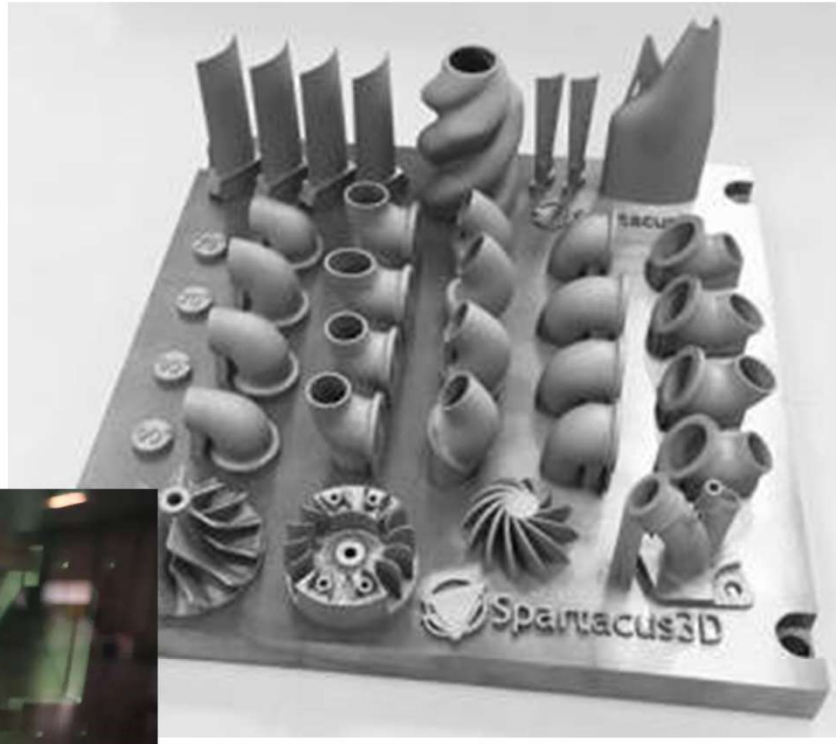
Introducing the Most Powerful Simulation Solution for Metal Additive Manufacturing

2018



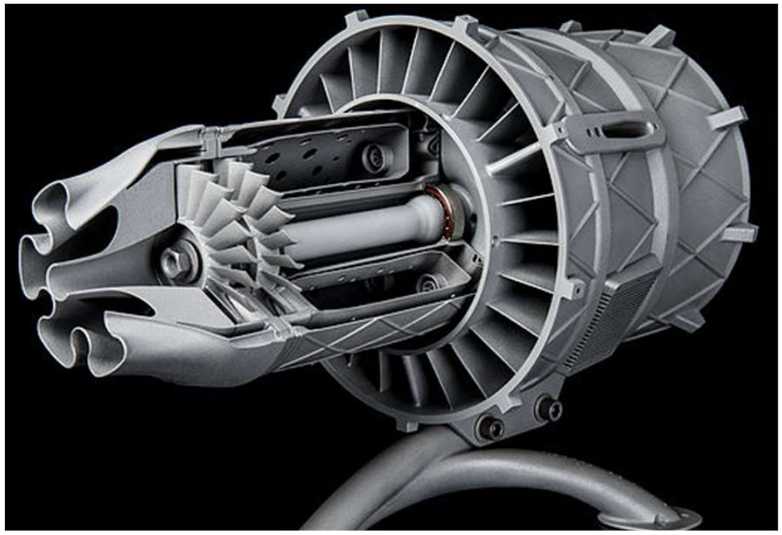
Metal Additive Manufacturing





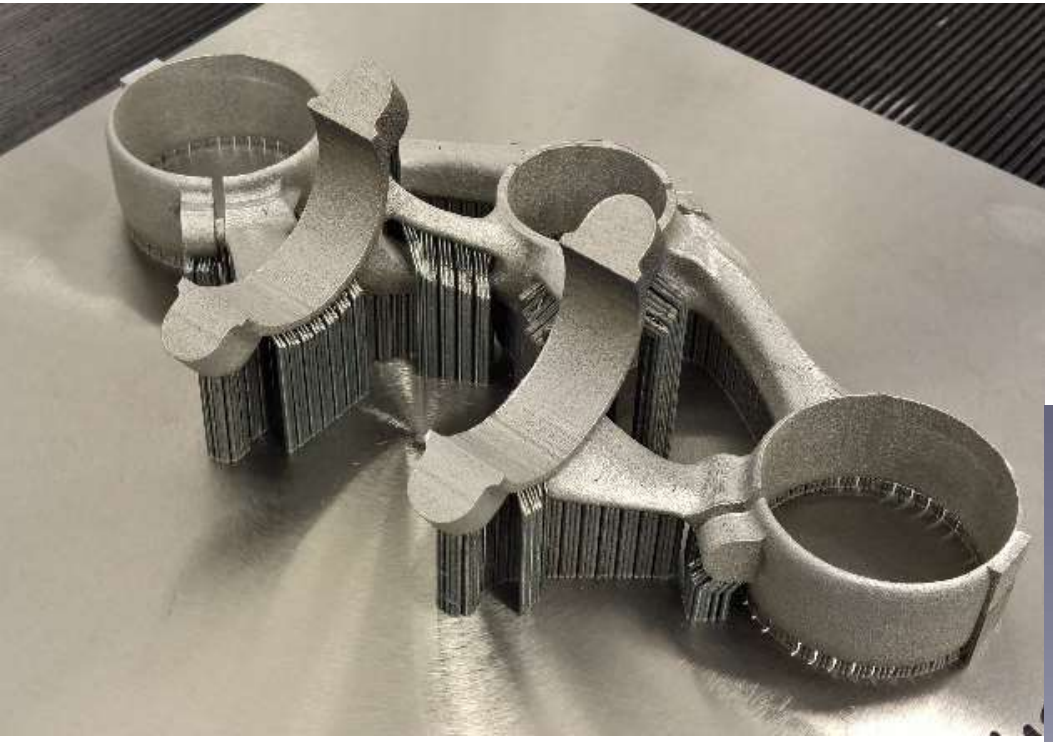
The AM Promise

- *Impossible to Manufacture*
- Part Consolidation
- Distributed Production
- New Material Properties
- Replacement parts



Topology Optimization is not enough

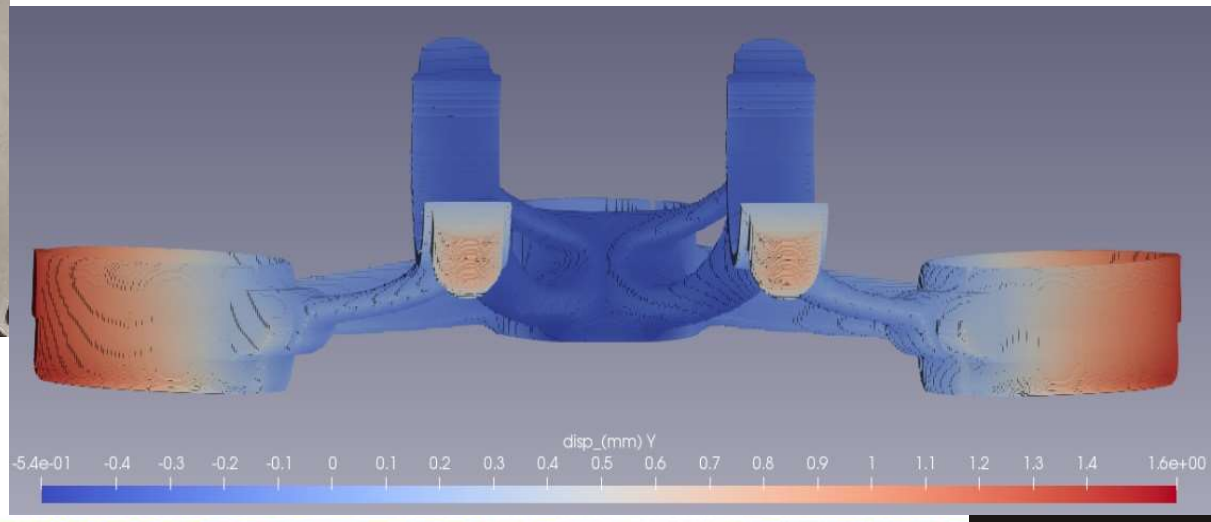
The Pitfalls



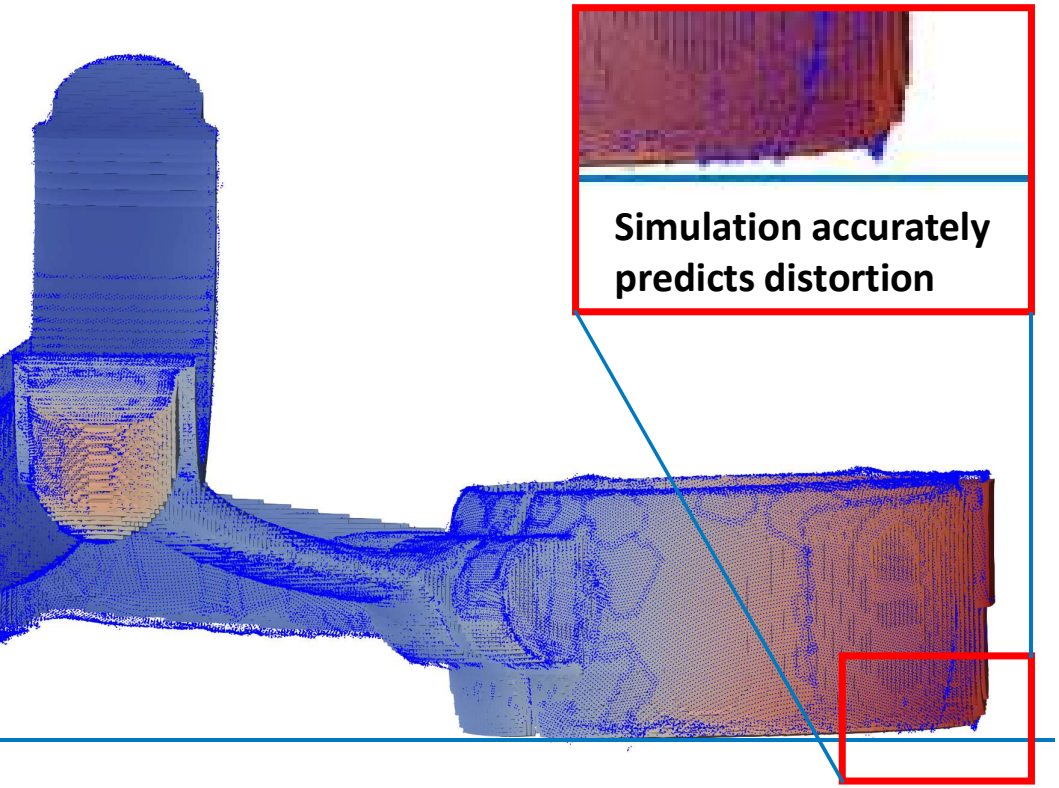
On the Build Plate

Simulation with ANSYS Additive Print

(red – shows where the part deforms upwards)



Why Simulate



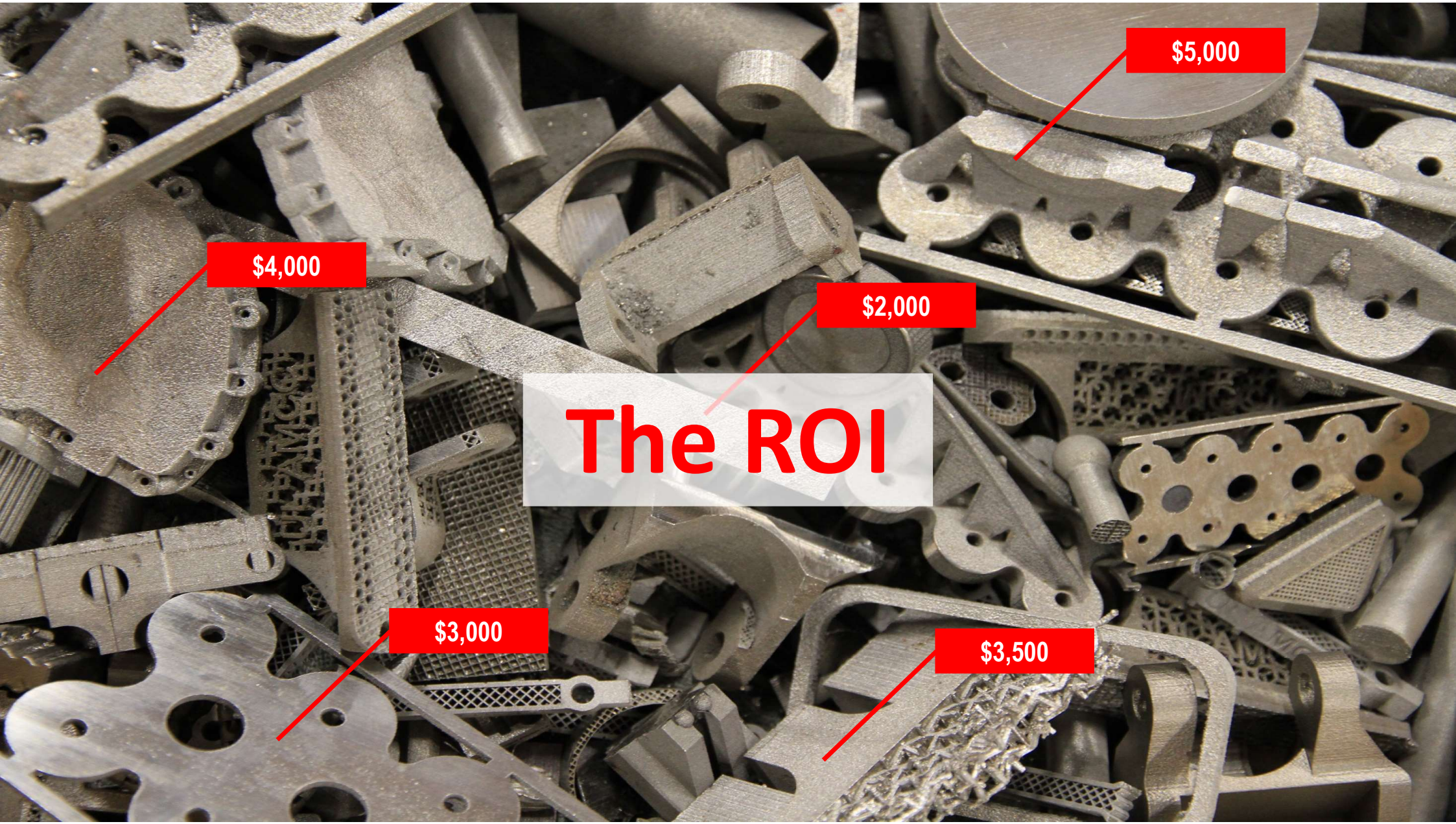
Accurately printed part

Distortion Compensated simulation results (blue) overplayed on STL file

Application example: Distortion compensation

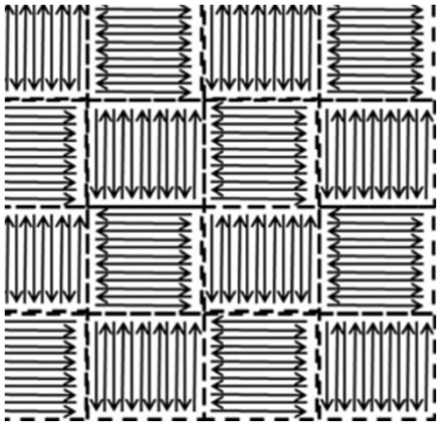
Original Geometry

Compensated Geometry


$5,000
$4,000
$2,000
The ROI
$3,000
$3,500

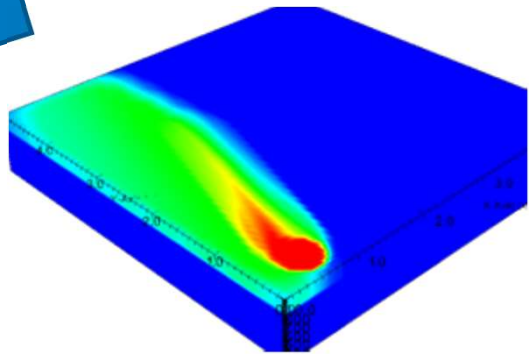
Details matter

Each Machine Manufacturer uses different **Scan Pattern** logic.



A unique **Scan Pattern…**

…results in a unique **Thermal History**

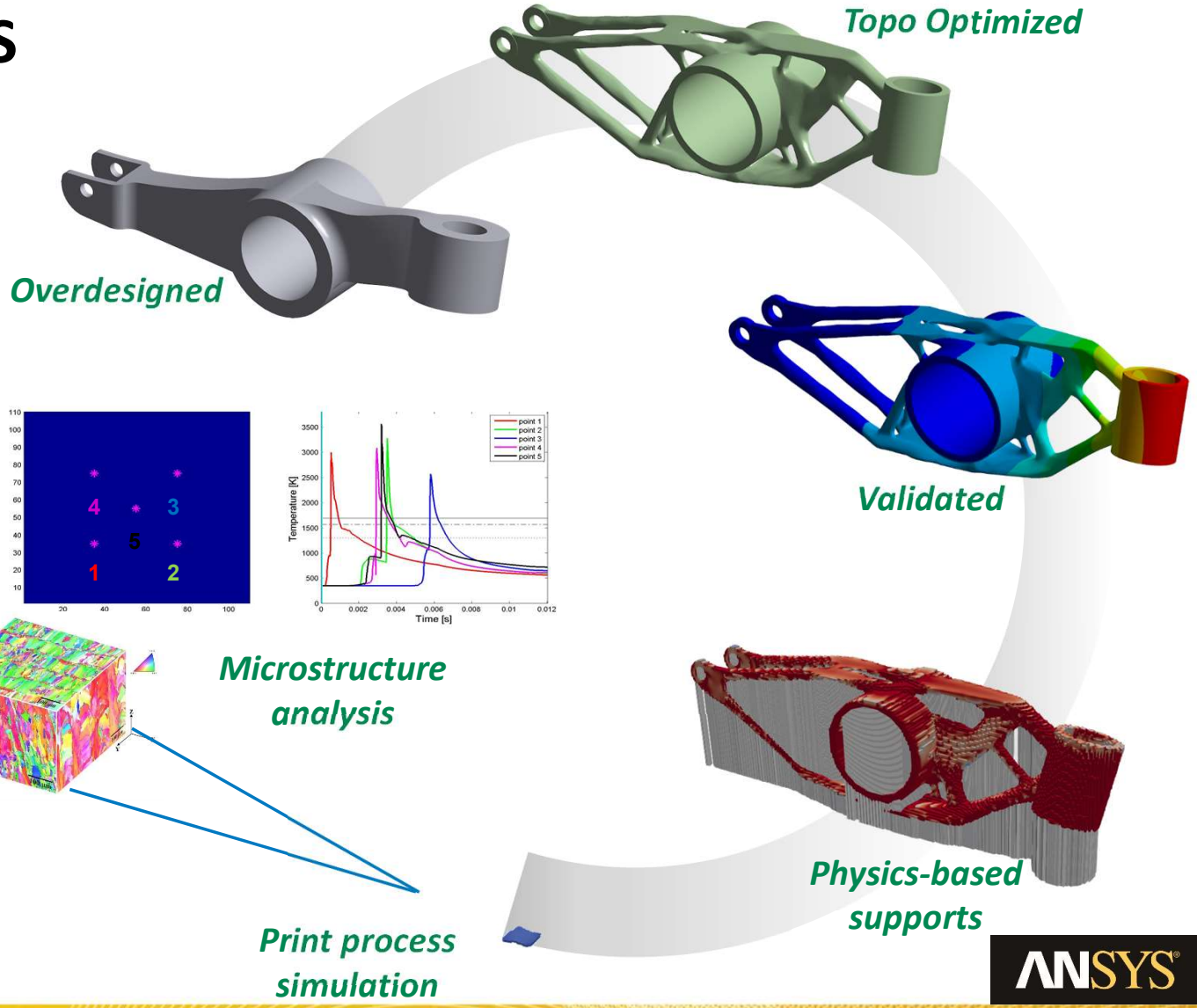


…which results in different:
- Strain Magnitudes
- Defect Distributions
- Microstructures
- Mechanical Properties

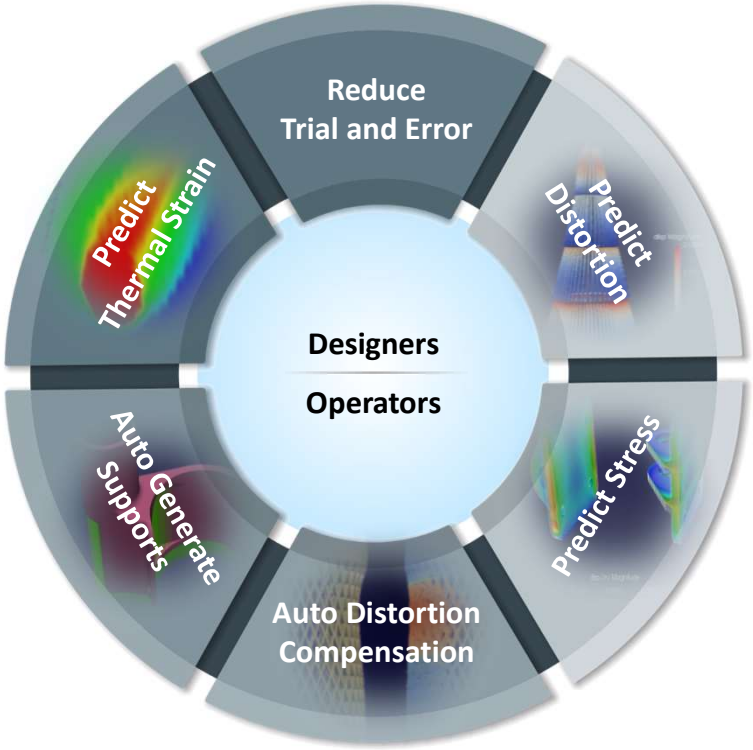
Which is why Predicting **Thermal History** at the **Meltpool level** for **Full-Scale** components is critically important!

Design for AM with ANSYS

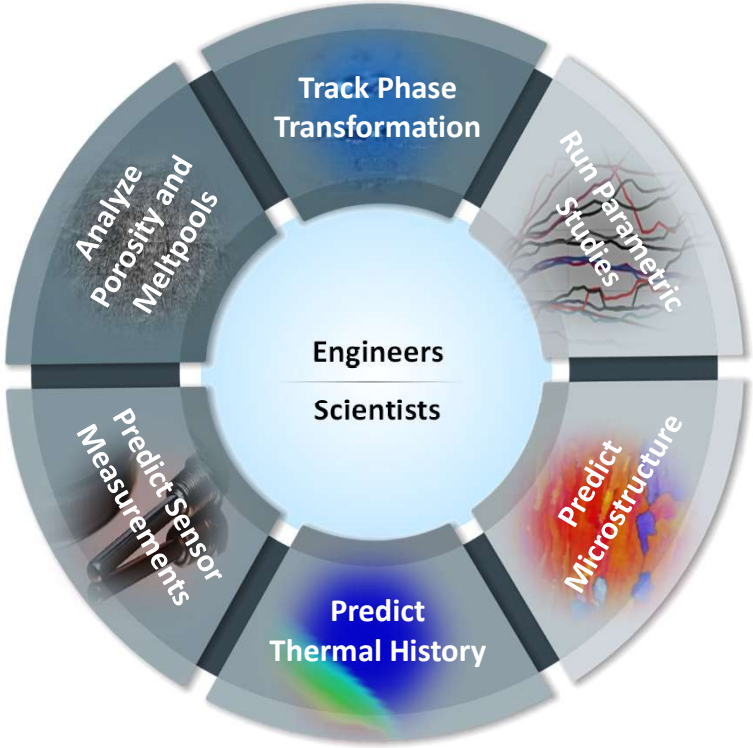
1. **Complete Design-to-Print Solution**
2. **Increased Confidence without Trial-and-Error**
3. ***Truly Successful*** **AM Production**



Different Types of Customer need AM Simulation



- *Designers in aero, defense, automotive, medical, etc.*
- *Metal AM machine operators*
- *Part manufacturing operations managers*



- *FEA analysts in aero, defense, automotive, medical, etc.*
- *Owners of "part qualification" within OEMs*
- *Materials/manufacturing researchers*

ANSYS AM products

Designers

Operators

ANSYS Additive Print

Lightweight, Standalone application

Delivered outside of Workbench

- **Desktop and Cloud availability**

Includes SpaceClaim

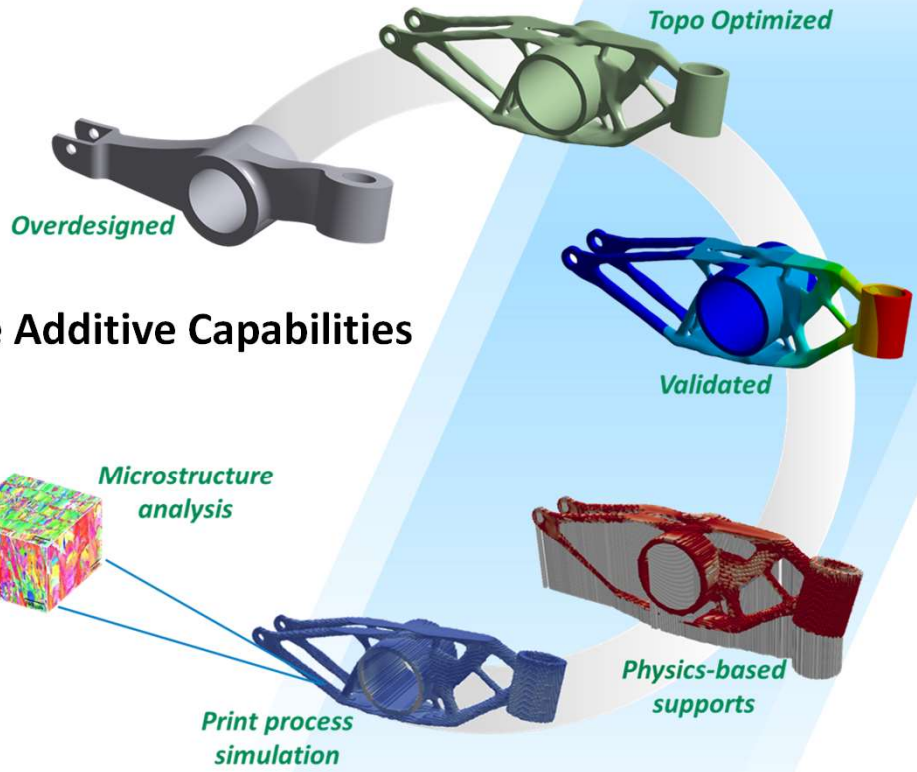
Targeted at Designers and Machine Operators

Predict build quality, part distortion, reduce build failures… maximize productivity of your AM machine

ANSYS AM products

Engineers
Scientists

ANSYS Additive Suite



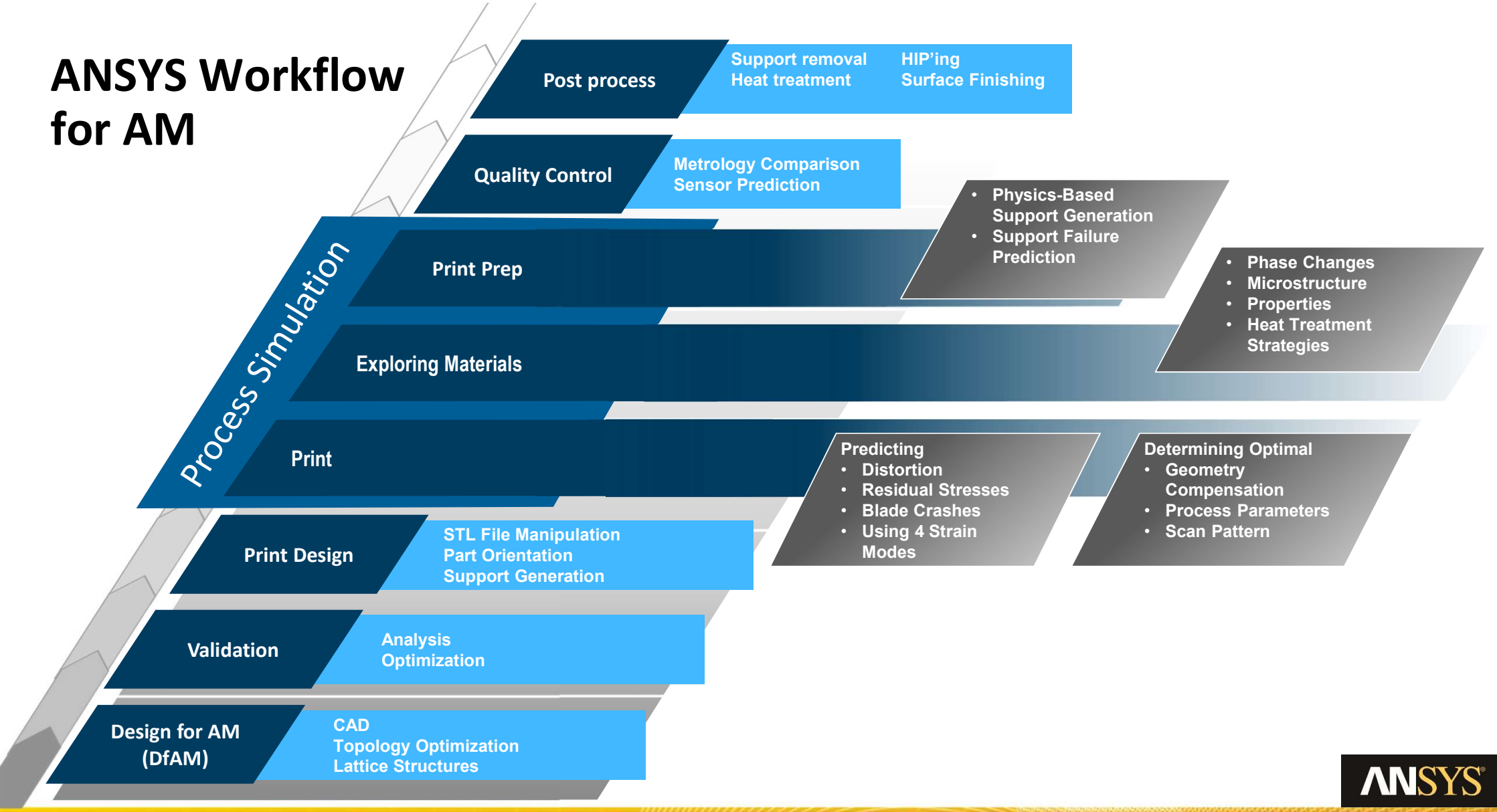
<u>Includes All ANSYS AM capabilities</u>

- **ANSYS Workbench & Mechanical Enterprise Additive Capabilities**
  - **Process Simulation**
  - **Topological Optimization**
  - **Lattice Optimization**
- **Additive Science**
  - **Scan-vector-level thermal analysis**
  - **In-depth material behavior**
- **Additive Print**

FEA analysts, AM experts and material researchers

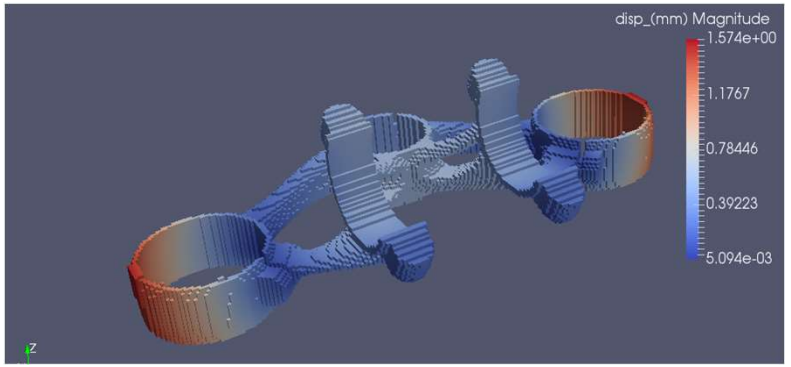
<u>Industry leading</u> analysis tool for AM processes and materials

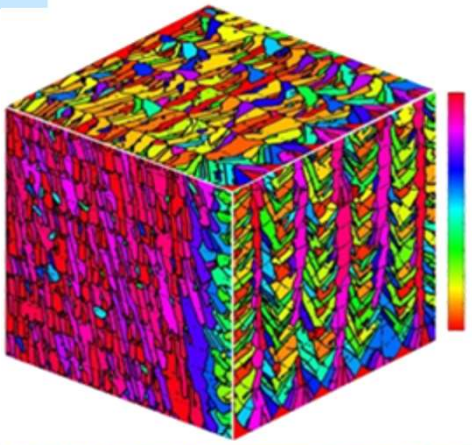
ANSYS Workflow for AM

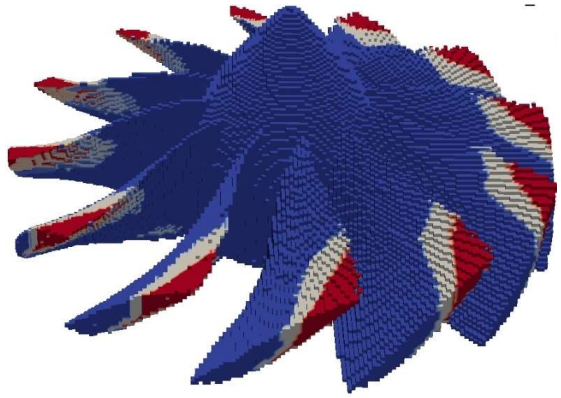


Features of ANSYS AM Suite

- Options for Simplified Thermal Analysis AND Detailed Thermal Analysis
- Topology / Lattice Optimization
- Distortion / Residual Stress / Failure Prediction
- Automatically Compensate Geometry for Distortion
- Four Strain Mode Options
- STL File Repair / Manipulation
- Location-Specific Microstructure Output
- Geometry-based Support Generation
- Physics-based Support Generation
- Porosity Predictions
- Simulate using Machine Scan-Vectors
- Thermal Sensor predictions

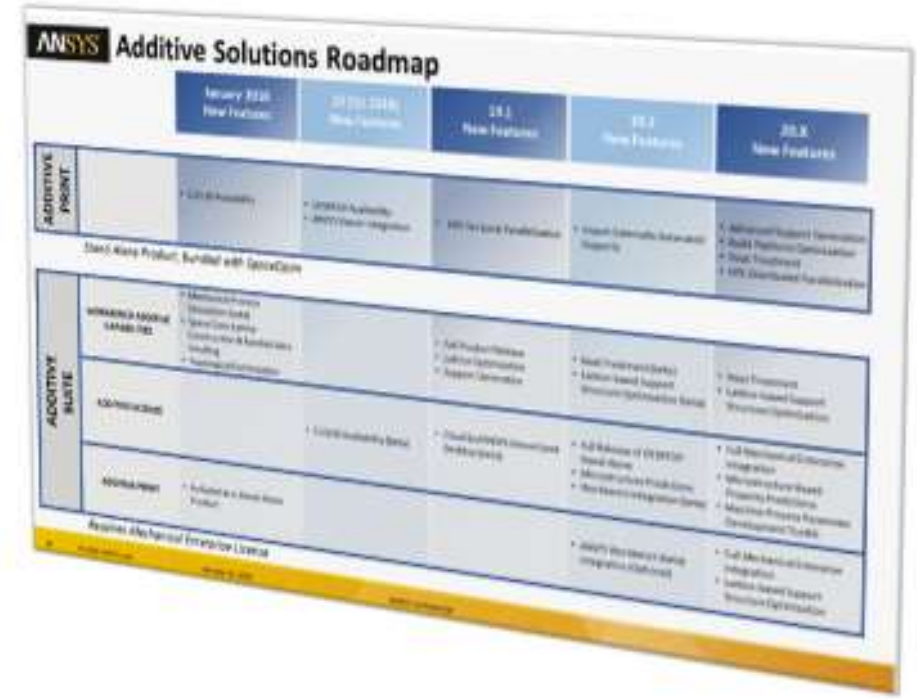






ANSYS is Committed to AM

- Actively Investing in new AM Capabilities
- Aggressive Roadmap for future development
- Partners with a strong ecosystem
  - Machine manufacturers
  - Materials Suppliers
  - Parts Producers
  - Universities
  - Research Labs



To Learn More:

- Upcoming Webinars
- Additional Materials
- Upcoming Workshops and Events

Please visit: www.ansys.com/additive