



keep reinventing

HP's Jet Fusion 3D Printing Technology: ***Enabling the next industrial revolution***

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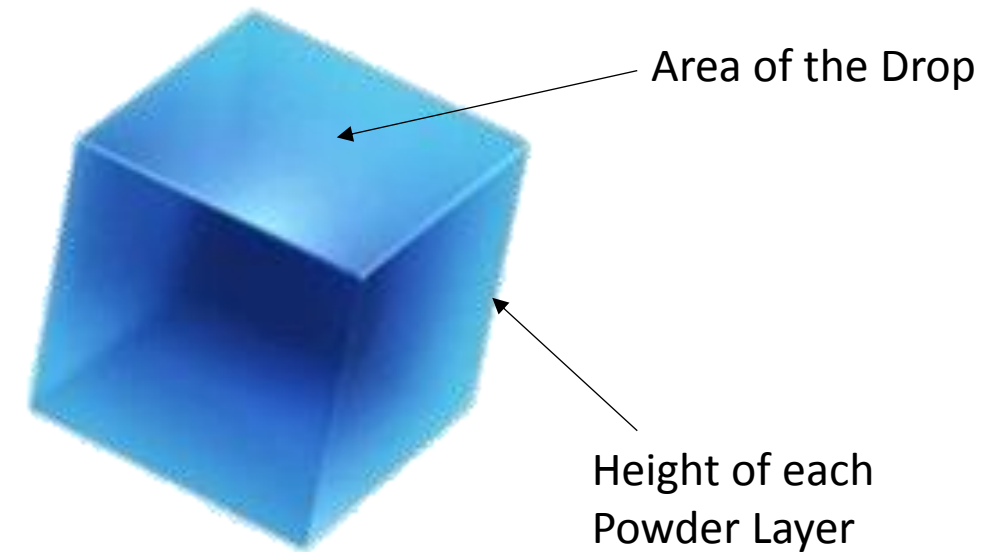


HP's Jet Fusion 3D Printing Technology: *Enabling the next industrial revolution*

Outline:

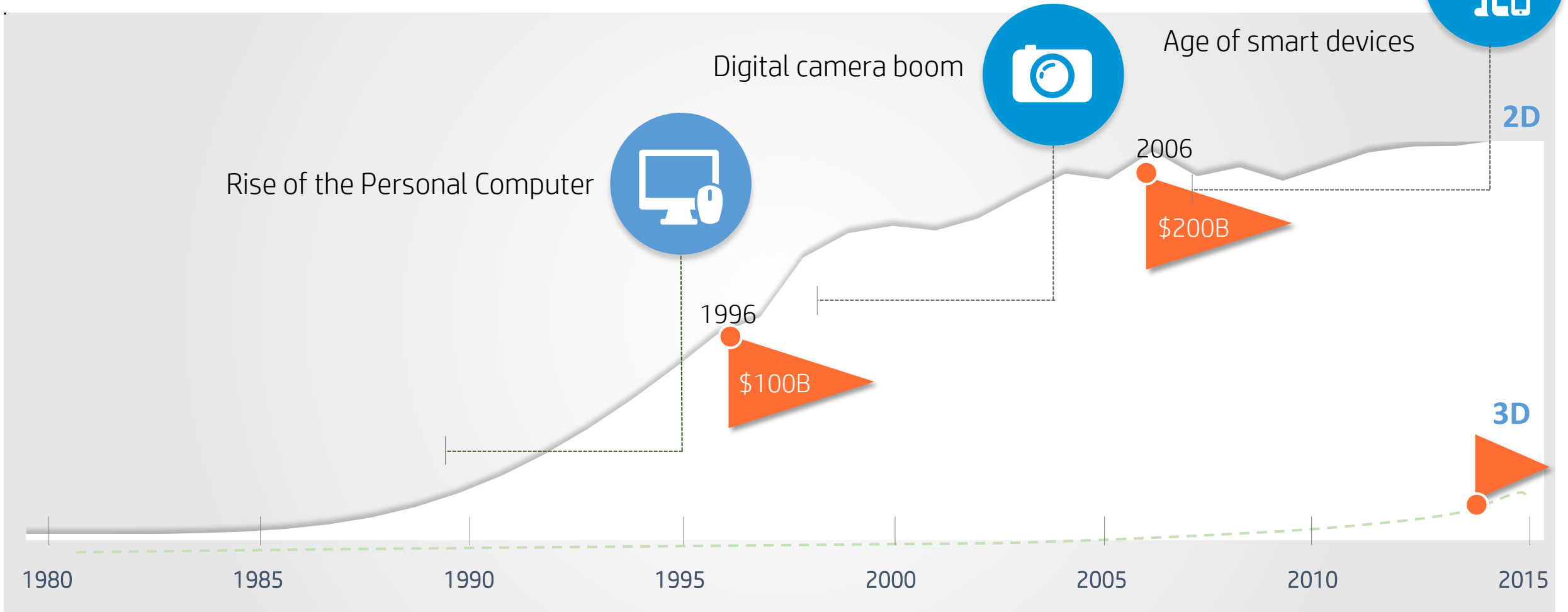
- **Introduction and Motivation**
- **MJF Value Proposition**
- **Overview of the MJF printing process**
- **The Future: *Voxel-scale Materials Science***
 - *Embedded Information*
 - *Embedded Intelligence*
- **Summary and concluding remarks**

What is a Voxel?



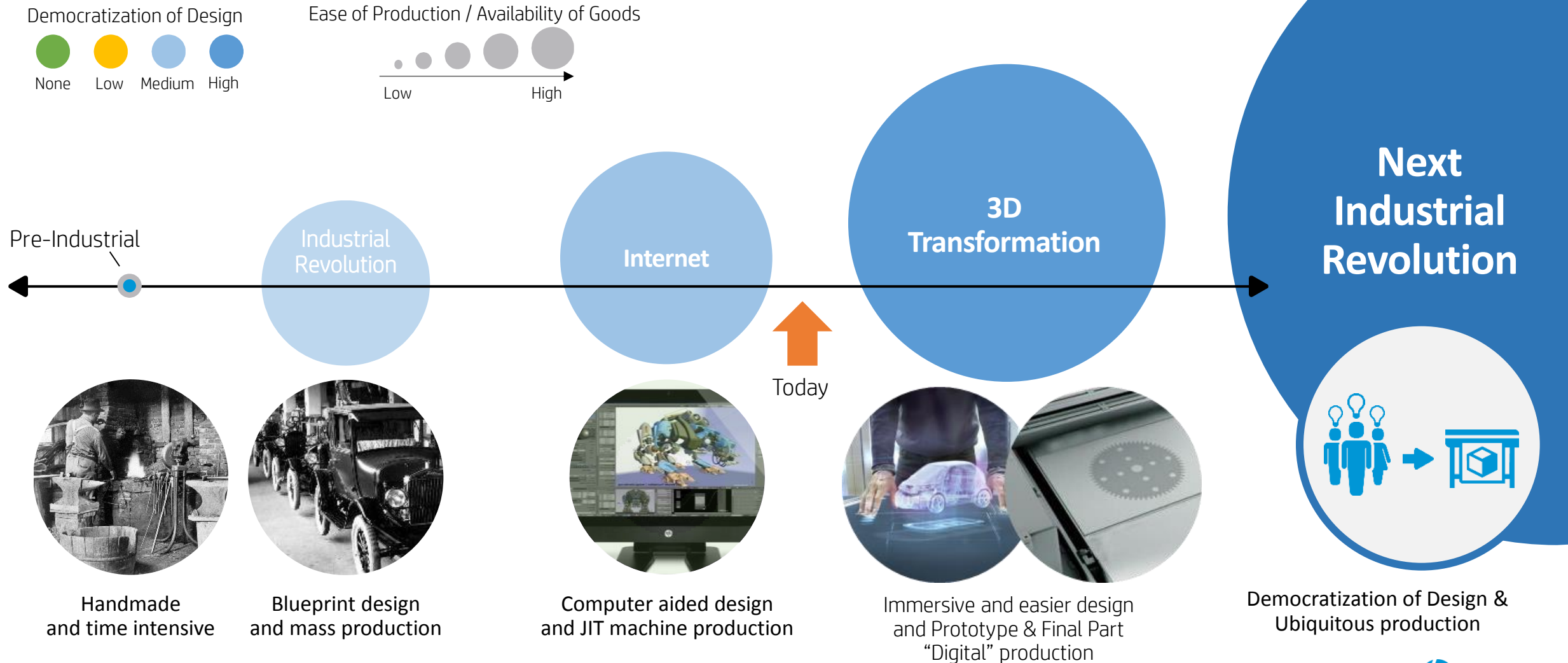
Introduction

The growth of the 2D printing market



Introduction

Driving the next industrial revolution by reinventing 3D





HP Multi Jet Fusion – Removing friction from adoption today...

...but what about tomorrow?



Speed



Quality



Cost



Reliability

...and reinventing manufacturing, production and product delivery in the future.

HP Multi Jet Fusion
Open Platform

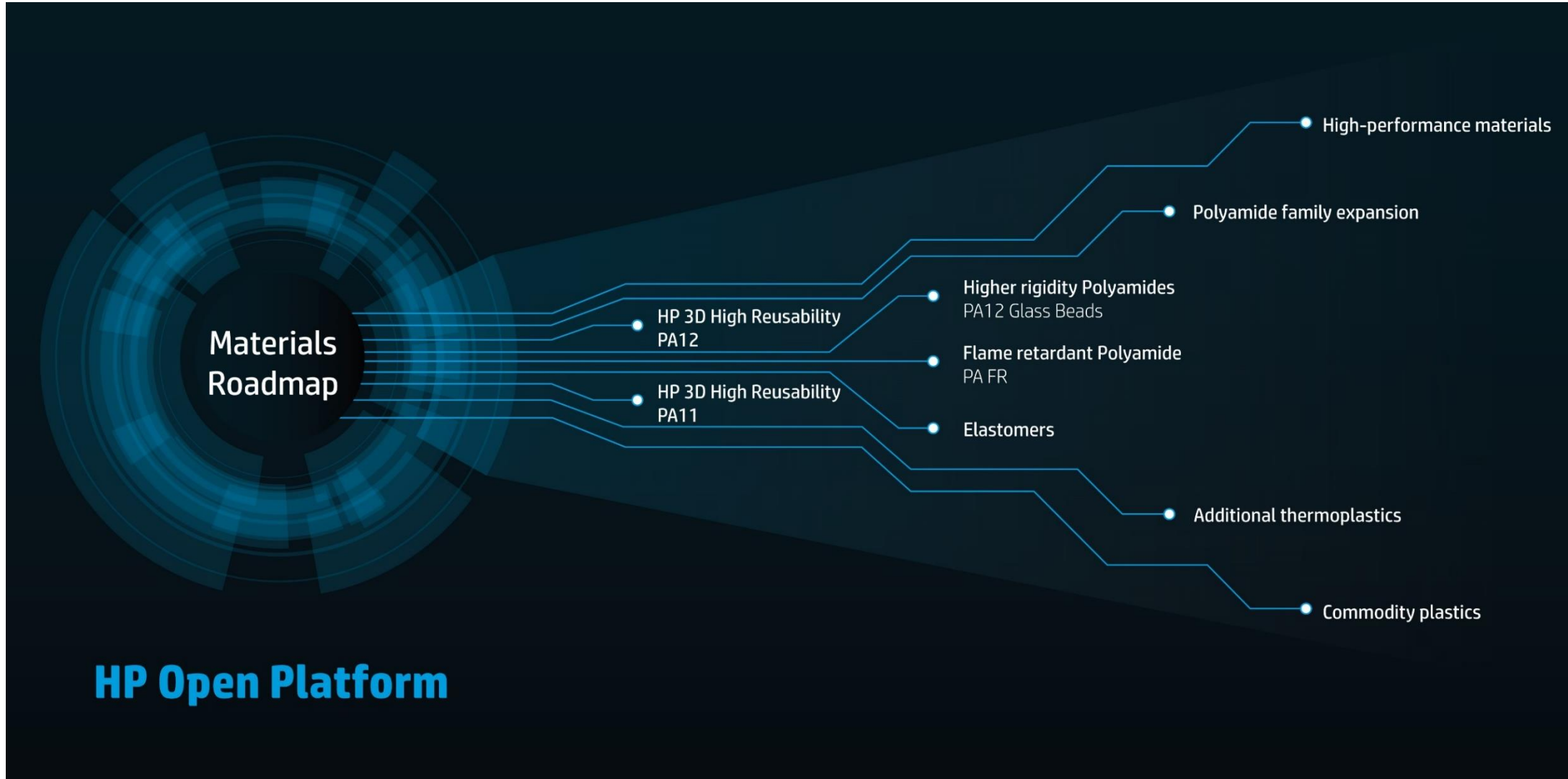


OPEN PLATFORM

Advancing widespread 3D printing adoption bringing down the barriers of 3DP adoption across industries through materials innovation with **HP Multi Jet Fusion “Open Platform”**



HP 3D Materials Portfolio for HP 3D Jet Fusion Printers





MJF Printing Physics and Materials Science

Introduction to HP's Multi Jet Fusion 3D Printing Process (Movie)

30 million drops per second

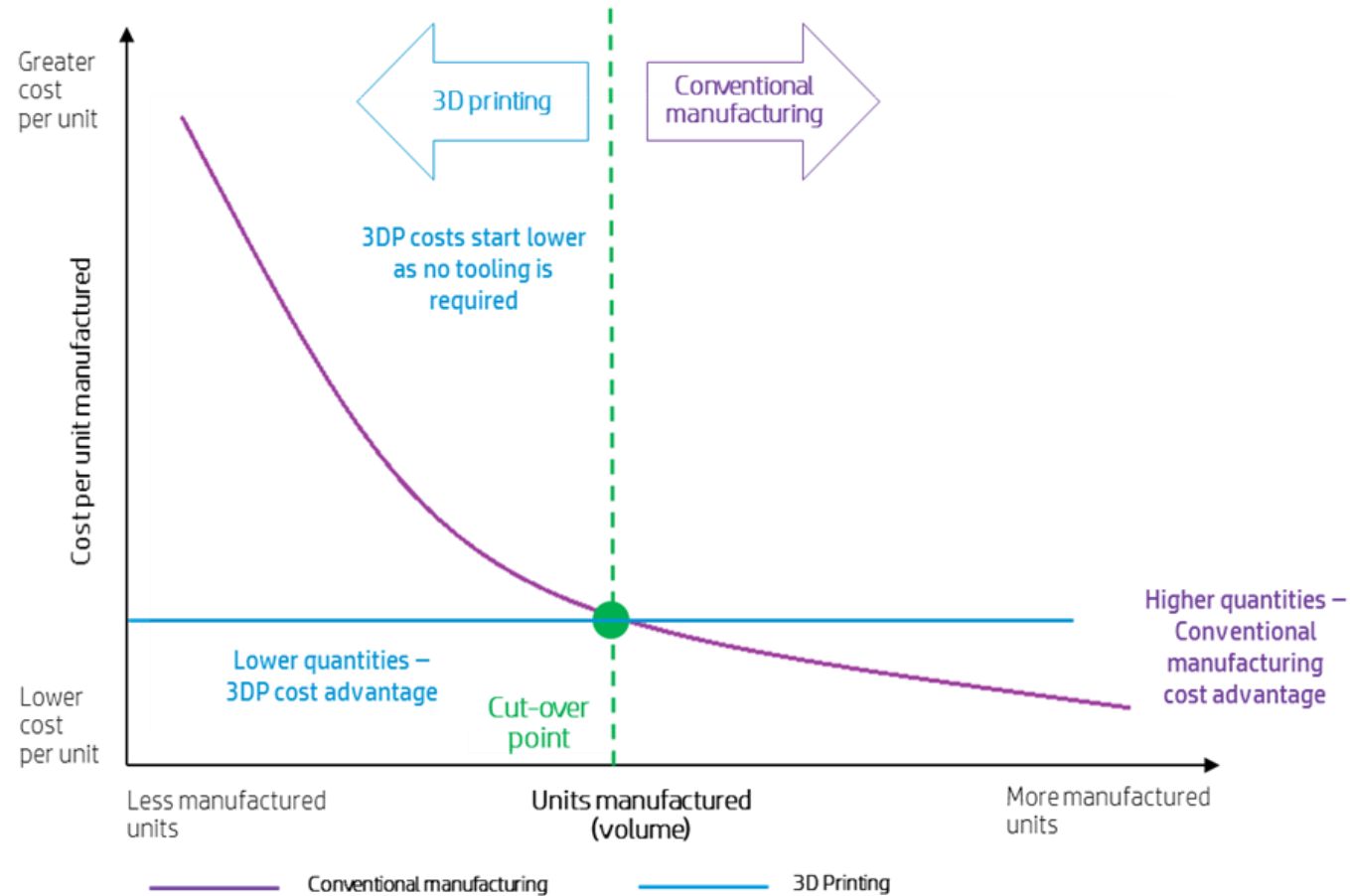
At 600 dpi, voxel area = $(23,000 \text{ droplets/in})^2 \sim 0.5 \text{ billion droplets/in}^2$

voxel depth = increments of ~ 50 microns (thickness of 1 powder layer)



Driving Breakthroughs in Manufacturing Cut-off Points

Economics of 3D Printing vs. Conventional manufacturing



Breakeven for HP Jet Fusion
Printer gear – 55,000 Parts

Defining Functional Parts



A 120 gram chain link
capable of sustaining
4500 kg



A ¼ lb chain link capable
of sustaining 10,000 lbs



The MJF printing process

HP Jet Fusion 3D
4200/3200 Printer



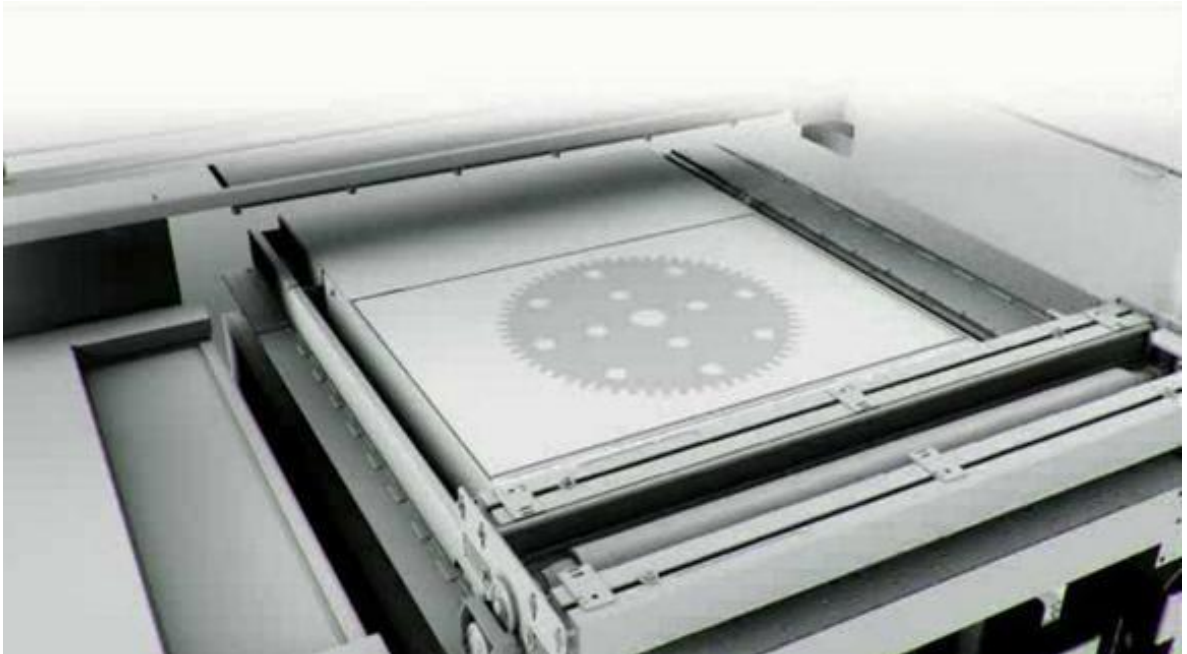
HP Jet Fusion 3D Processing
Station with Fast Cooling

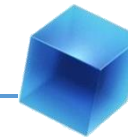


HP Jet Fusion 3D 3200 printing solution



HP Jet Fusion 3D 4200 printing solution

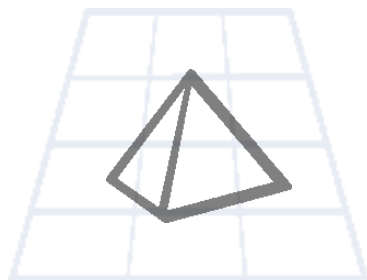




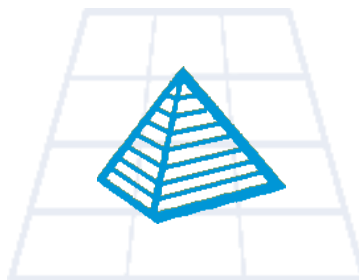
HP Design to Print Solutions



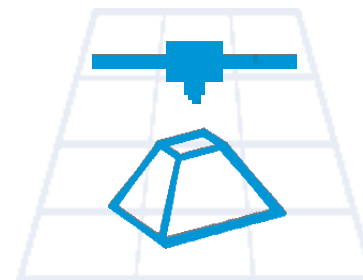
Idea



Design



Print preparation



Print

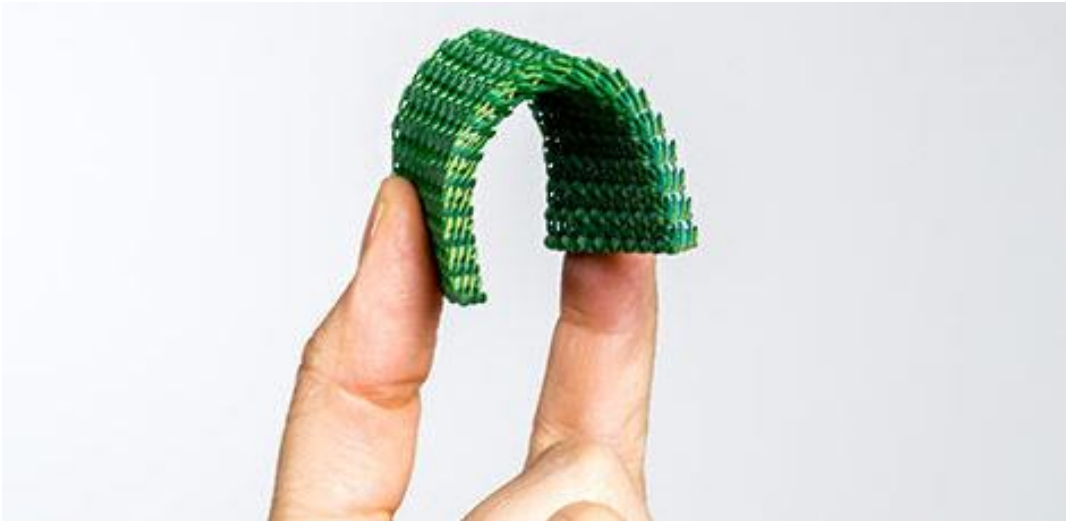
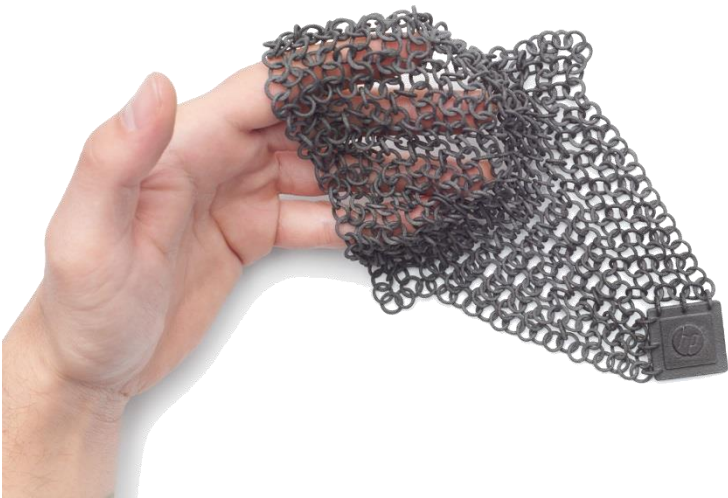
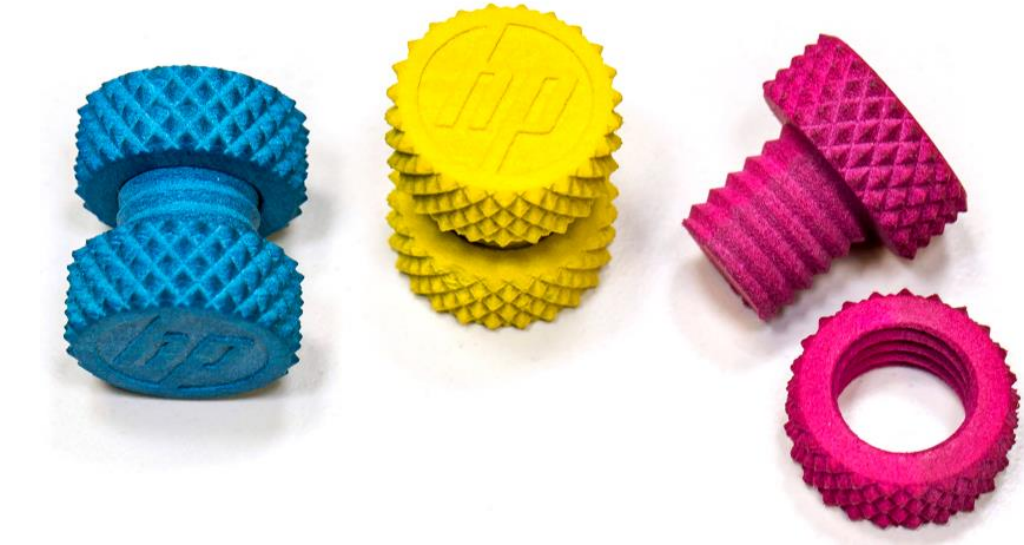
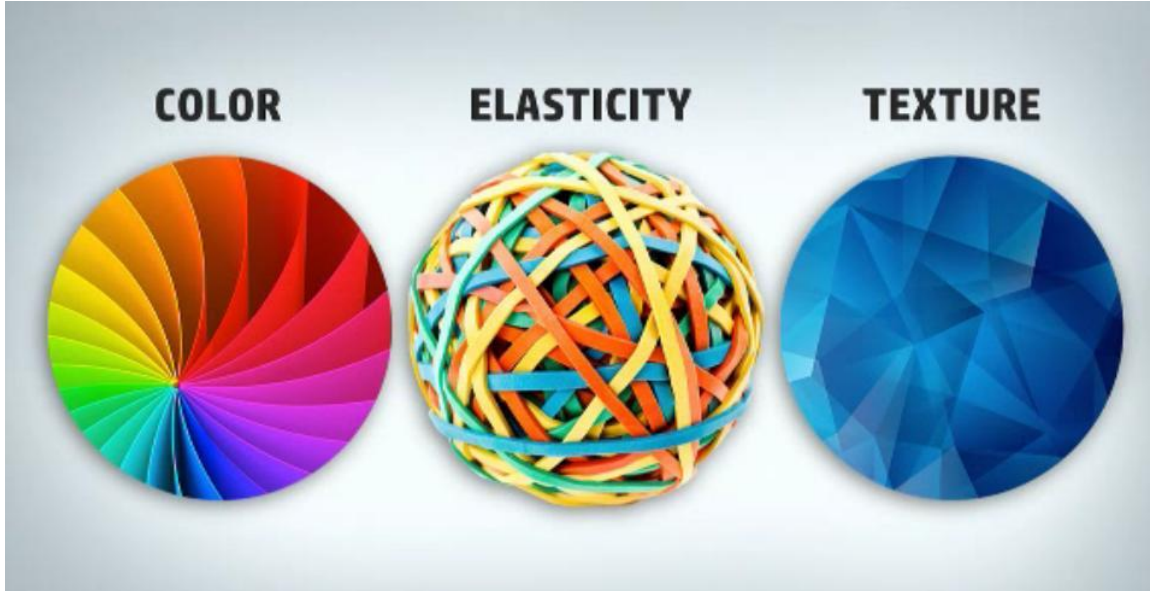


Physical Object

Printers management and monitoring



The Future: *Voxel-scale Materials Science*





Applications – Embedded Information

Embedded Information and Secure 3D Printing RAPID Video

Applications

Enabled by MJF: Embedded information for security, DRM, inventory, etc.

Enhanced functionality for obsolescence tracking

Embedded 3D color used
as a passive wear indicator



Marking and anti-counterfeiting

Photoluminescent materials
visible under UV light





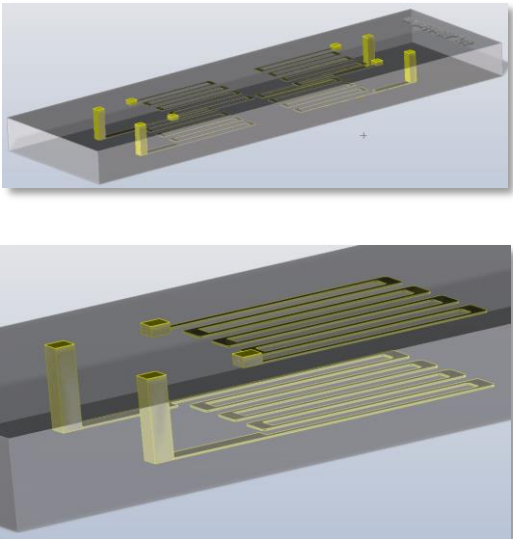
Applications – Embedded Intelligence

Embedded Electrical Circuits and Smart Parts RAPID Video

Applications

Enabled by MJF: Embedded electronics using printed metal nanoparticles

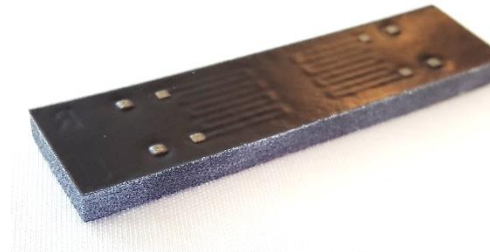
Embedded Strain Gauges



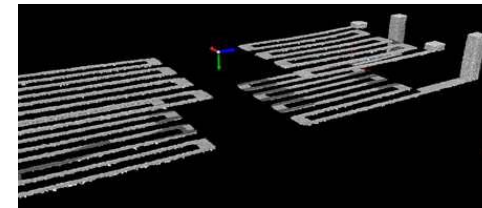
MJF Printing Process



MJF Printed Electronic Part



X-Ray of Internal Wiring



Bluetooth Enabled Load Cell

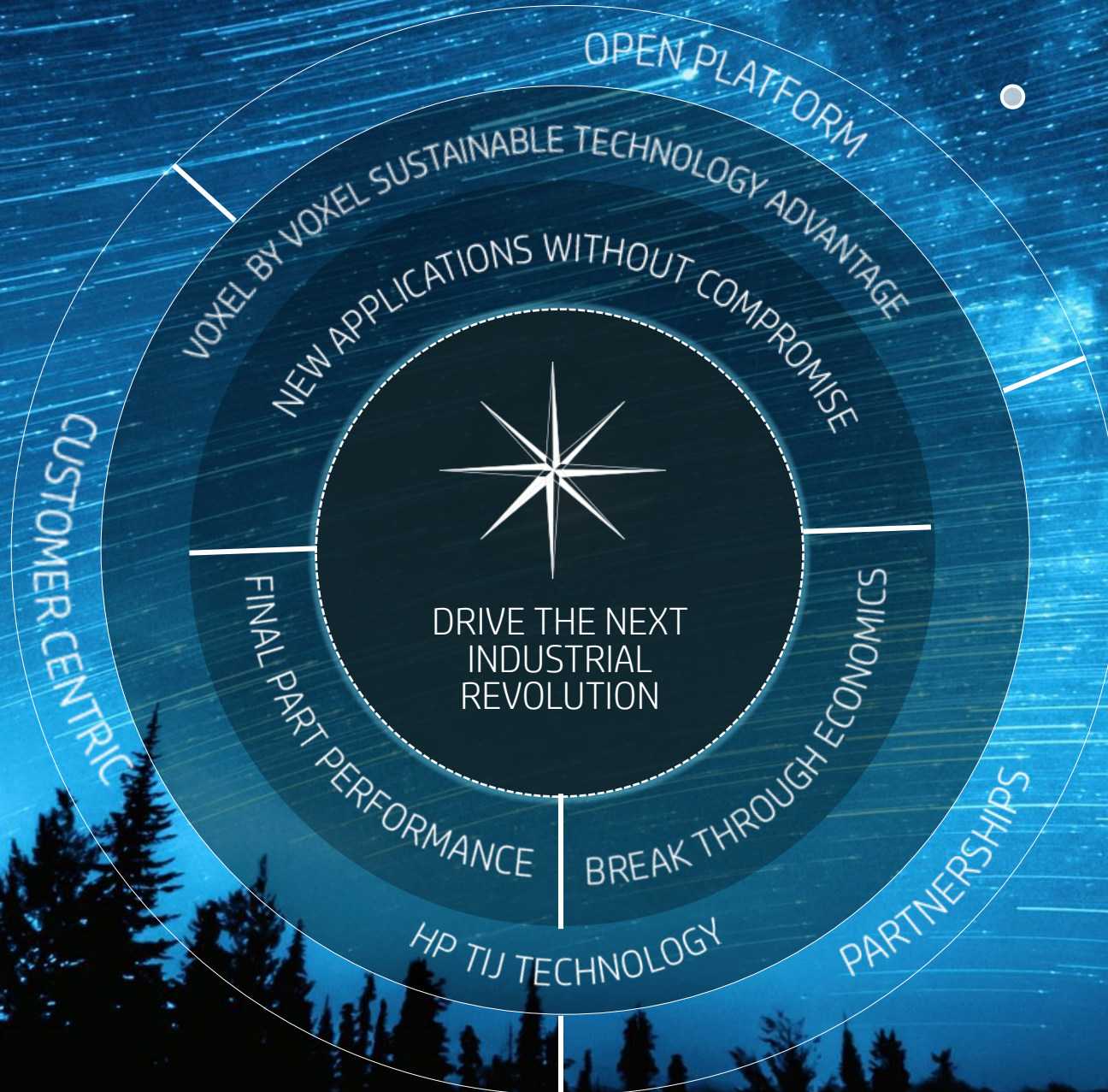


3D Design

Print Process

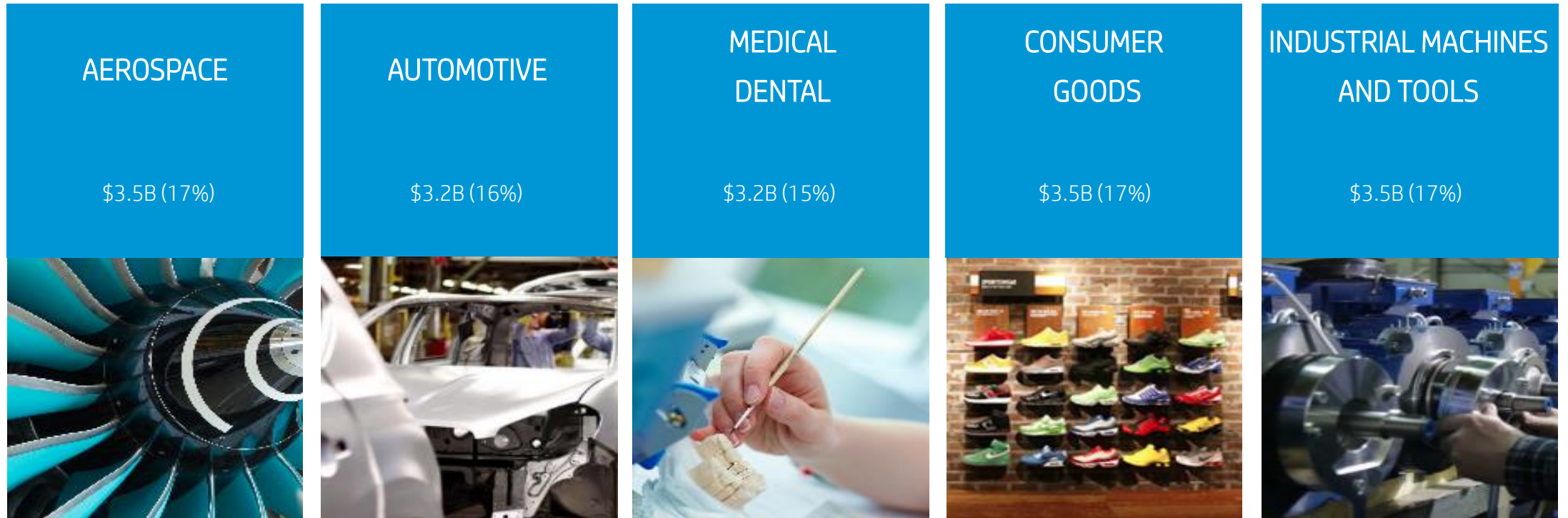
Embedded Load Cell

Smart Part



Backup

Top 5 verticals represent ~80% of 2020 3-D Market



Requirements for prototyping are relatively homogeneous across verticals

Where not to play – Consumer/Home market

'20 (\$B)
(% share)

Prices from May announcement

- Jet Fusion 3200, \$130K
- Jet Fusion 4200, \$200K
- Processing Station, ~\$25K