СОВРЕМЕННОЕ ОБОРУДОВАНИЕ

СОЛВЕР
ГРУППА КОМПАНИЙ

atomexpo

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Industrial Additive Technologies: Trends

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DDMlab
Since 1997

stratasys

BeAM
BE ADDITIVE MANUFACTURING

AddUp
GLOBAL ADDITIVE SOLUTIONS

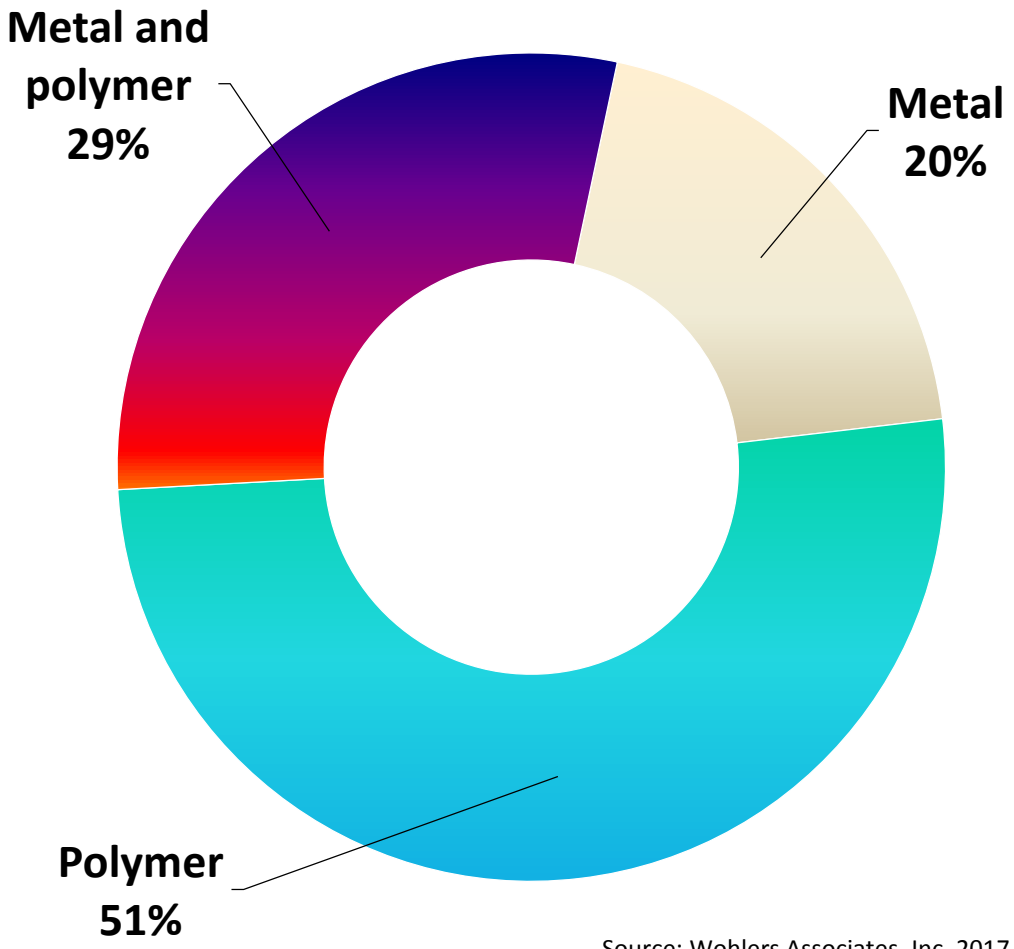
Allows:

- Remove restrictions in R&D incl. topology optimization can provide a reduction in the mass of products up to 60%
- Reduce losses in forced design changes
- Reduce production preparation cycles 10-50 times
- Reduce the shortage of working professions
- Provide small-scale production of products on individual orders

Also allows:

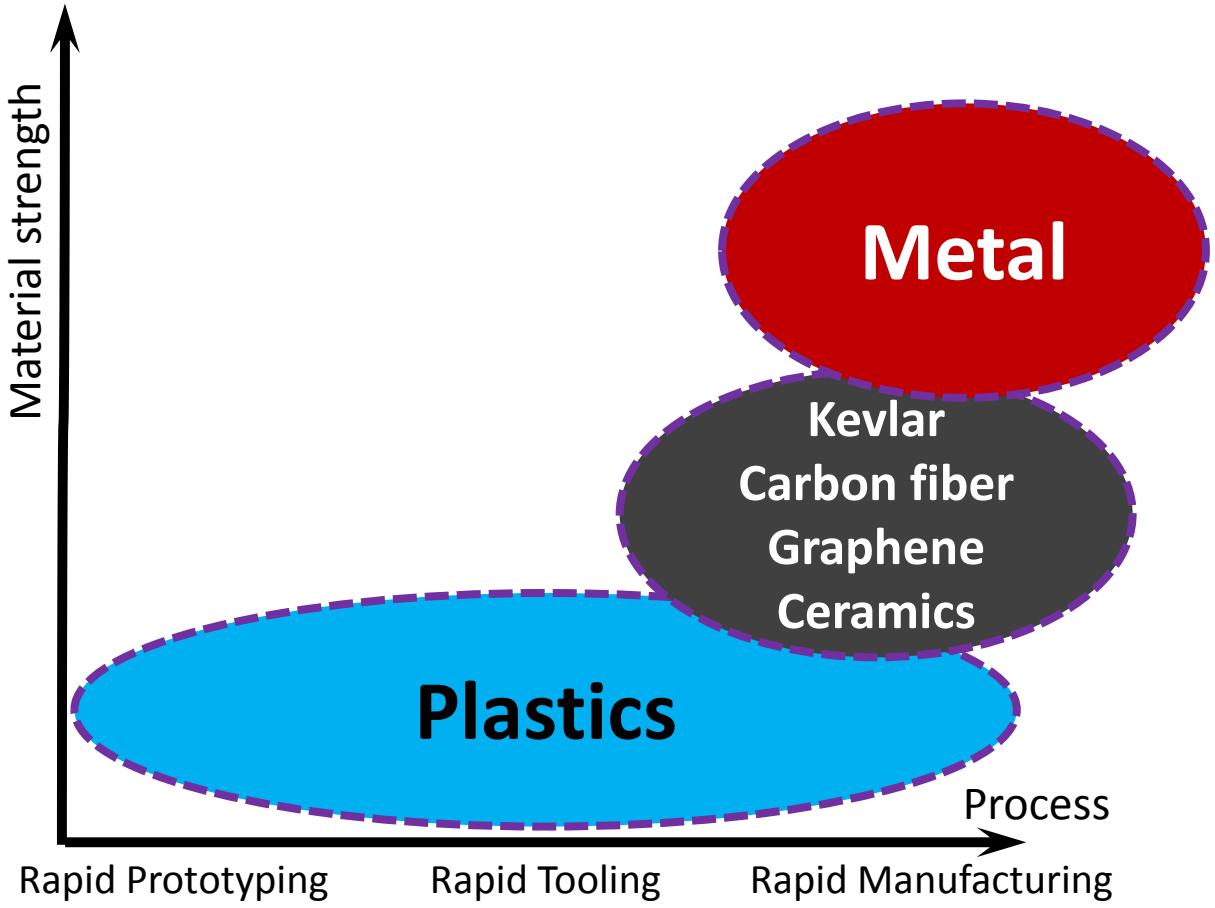
- Refuse from auxiliary production materials
- Refuse from the expensive technological equipment in pre-production
- Refuse from part of workshop machines, energy technology equipment (ovens, autoclaves, vacuum molding machines, etc.)
- To place in office
- Reduce production waste
- Reduce warehouse and production area 3-5 times

Consumption of materials by service providers

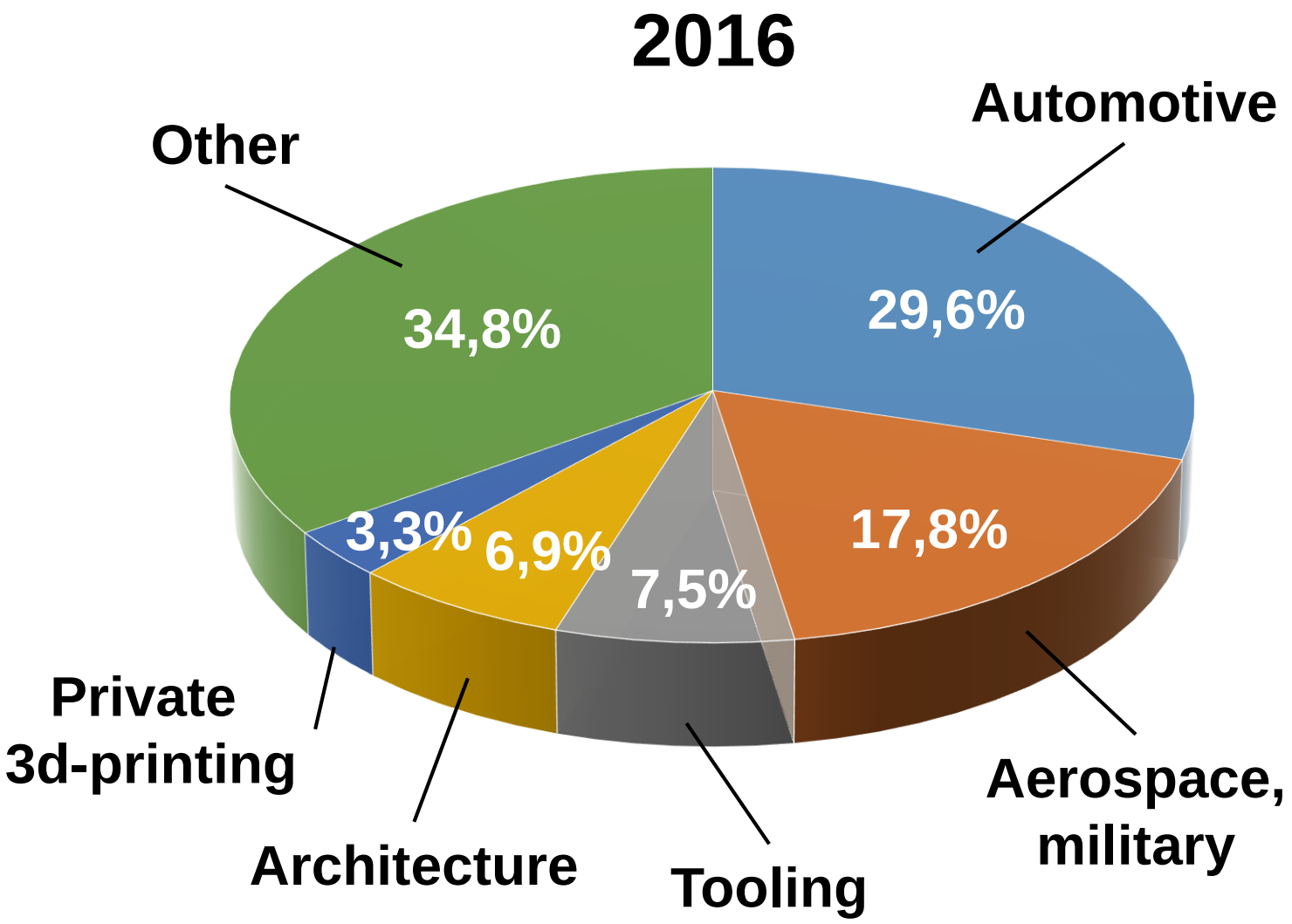


Source: Wohlers Associates, Inc. 2017

3D printing materials in process



Source: TranPham Materials, 2015



2020 – $28,9B

2017 – $16B

+22%

2016 – $13,2B

Source: International Data Corporation (IDC)

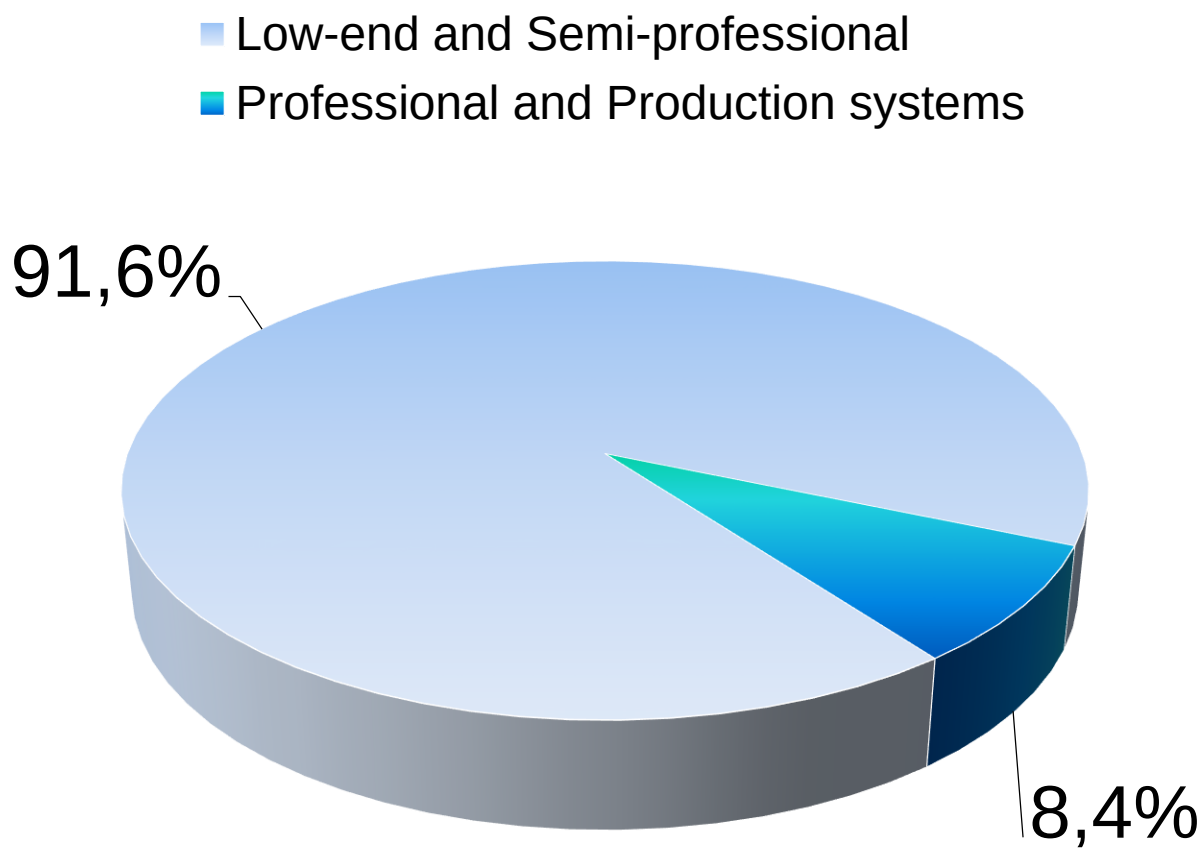
2020 – 6 700 000 Units

x15

2016 – 450 000 Units

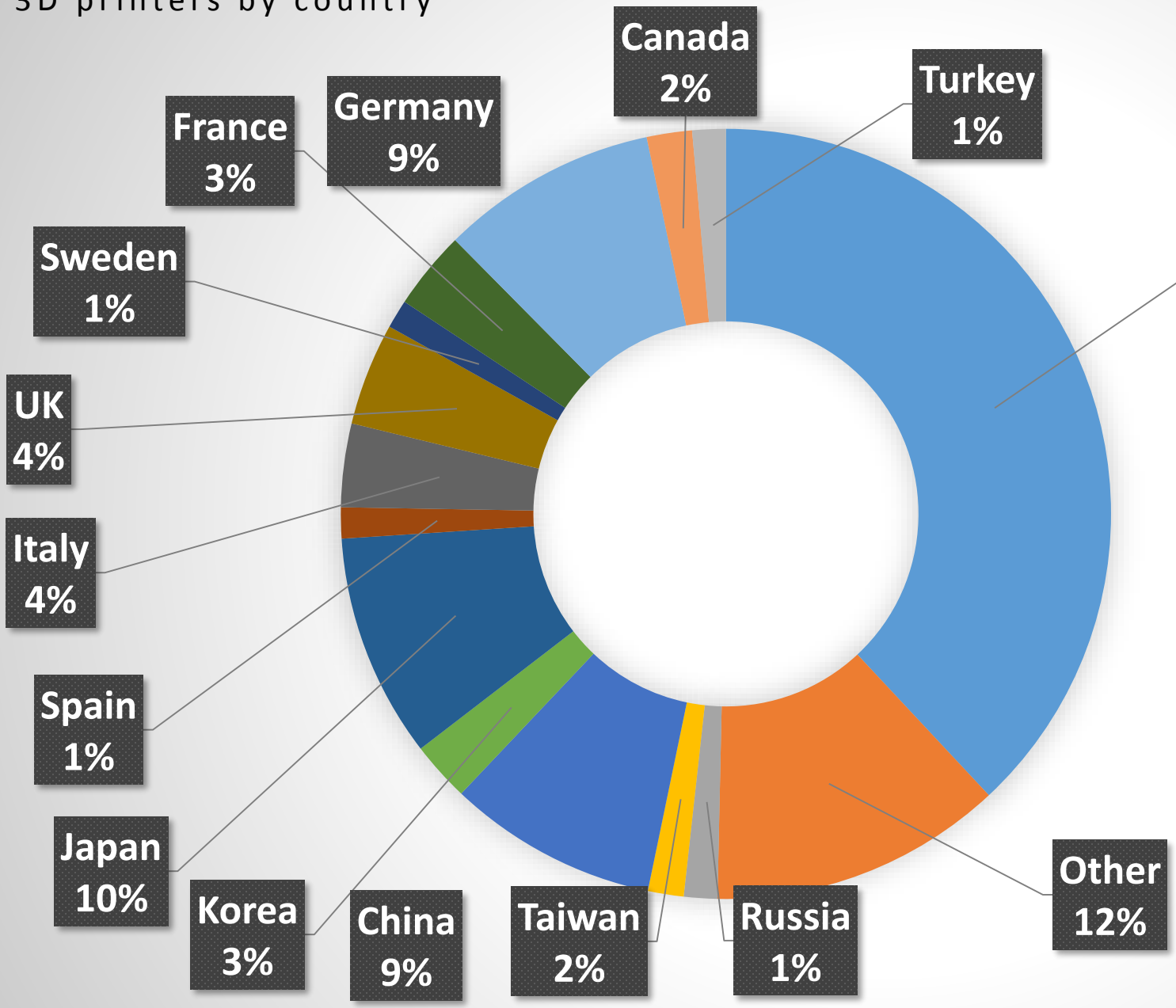
x2

2015 – 220 000 Units



Source: Gartner

3D printers by country

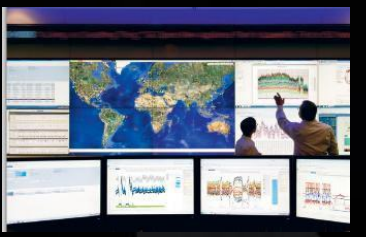


U.S – 38%

Europe + Russia – 25%

Source: Wohlers Associates, Inc. 2014



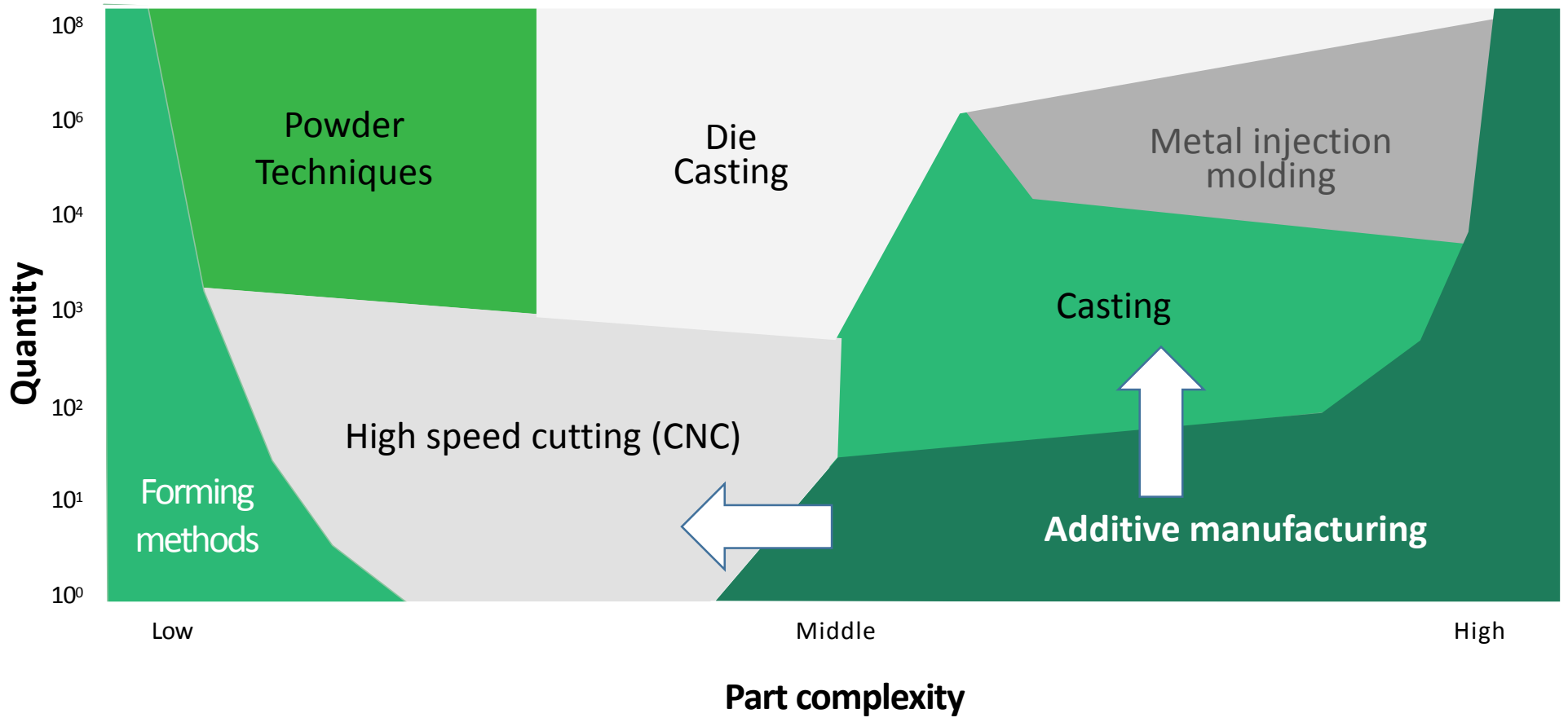
- Advanced robots
- Augmented reality
- Simulation
- Horizontal/vertical integration
- Industrial internet
- Cloud
- Cybersecurity
- Big data and analytics

Additive manufacturing

Source: The Boston Consulting Group

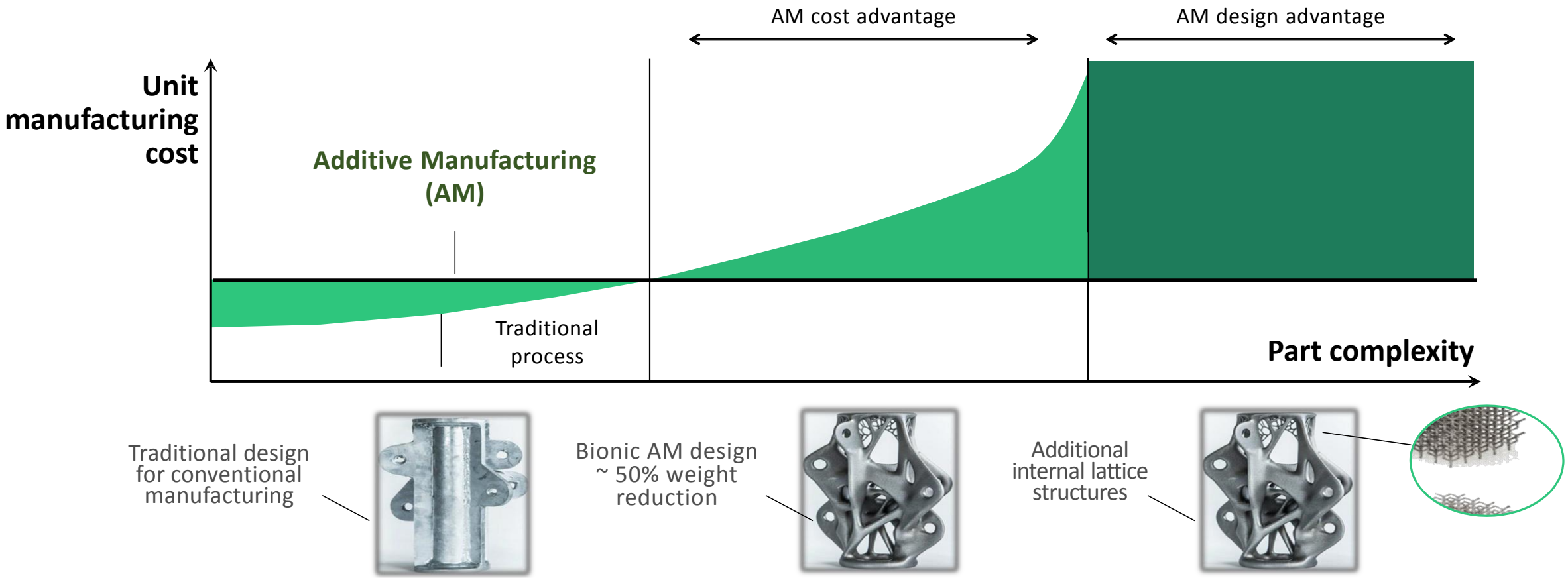
Encourages:

- Development of new "advanced" materials
- Multi-material printing
- Improving equipment reliability
- Conveyor automation
- Automation in removing support or rejecting it
- Replication of parts during repair and maintenance
- Increase the speed of printing
- Minimization of personnel, personnel evolution
- Metrological support in AM-processes
- Improved print quality
- “Advanced" SW
- New standards and regulations



AM will grow significantly as capabilities increase

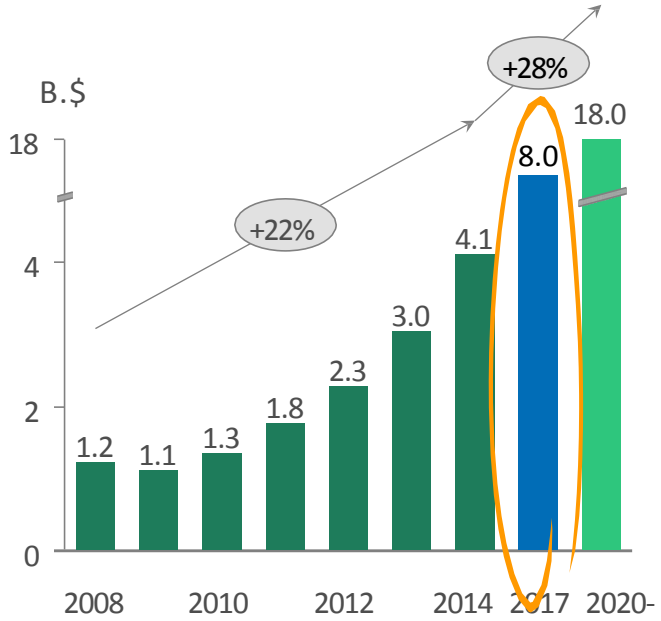
Source: MTU Aero Engines



Additive Manufacturing is manufacture for design instead of design for manufacturing

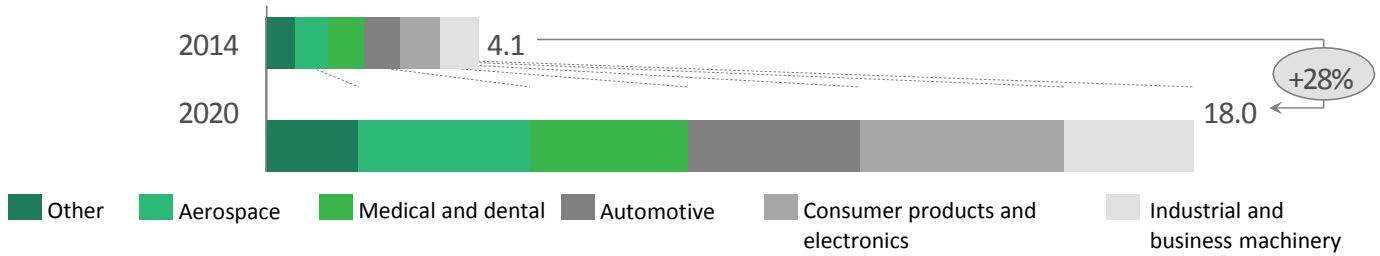
Source: Fraunhofer ILT; Arup Group

Global AM market

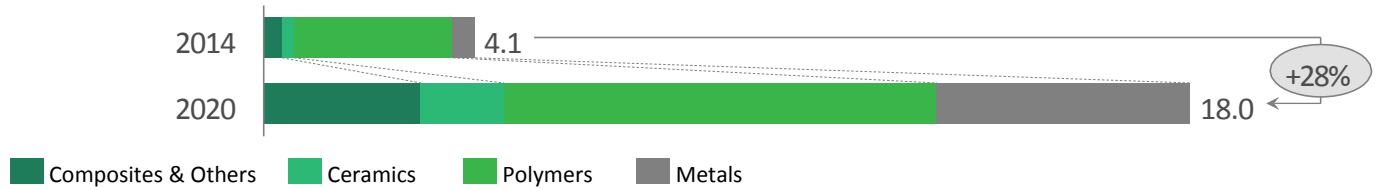


Significant growth, expected to continue

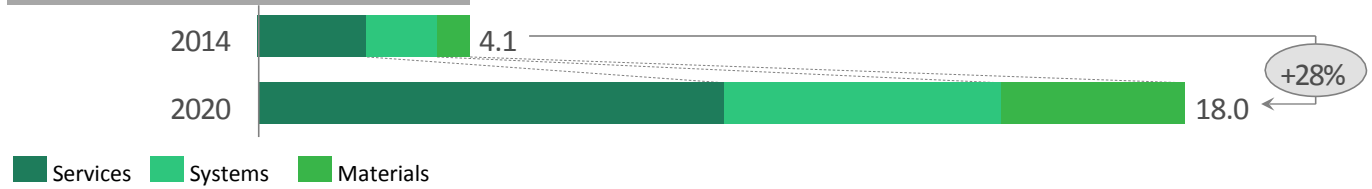
Segment view



Materials view



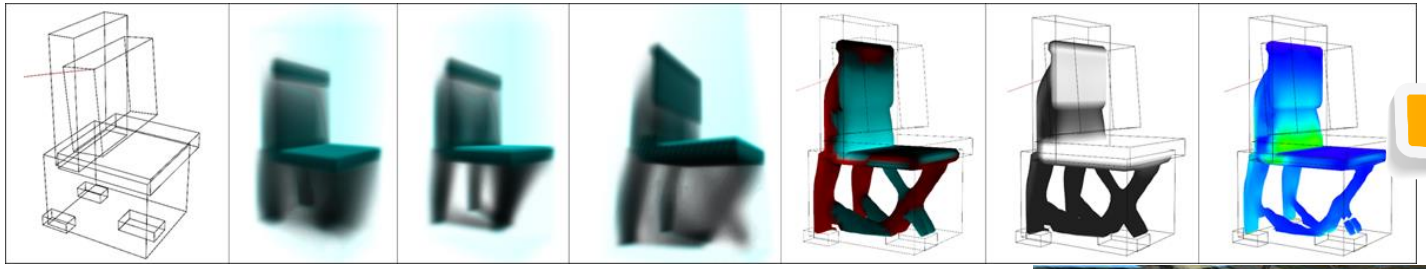
Value chain view

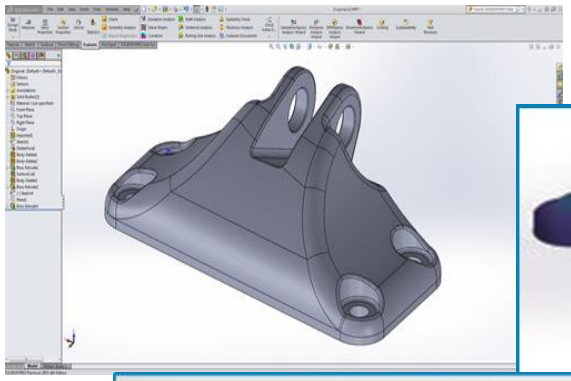


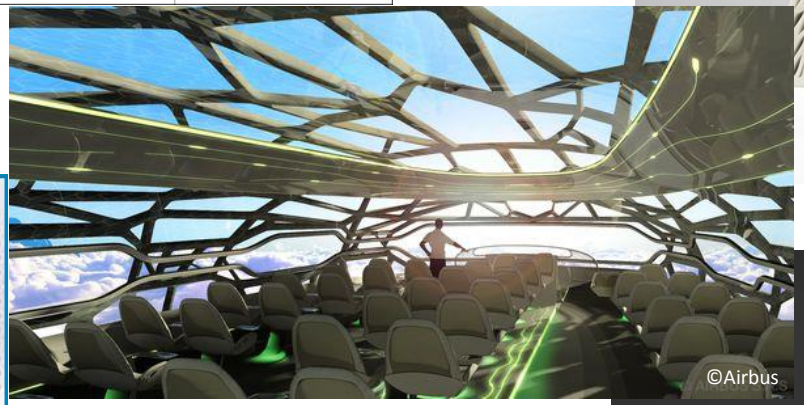
Market growth strongly depends on industry segment, materials, and value chain step

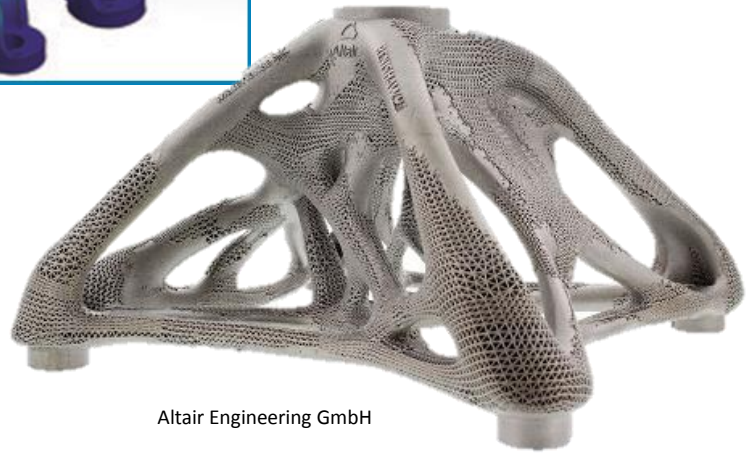
Source: Boston Consulting Group

Topological optimization and bionic design

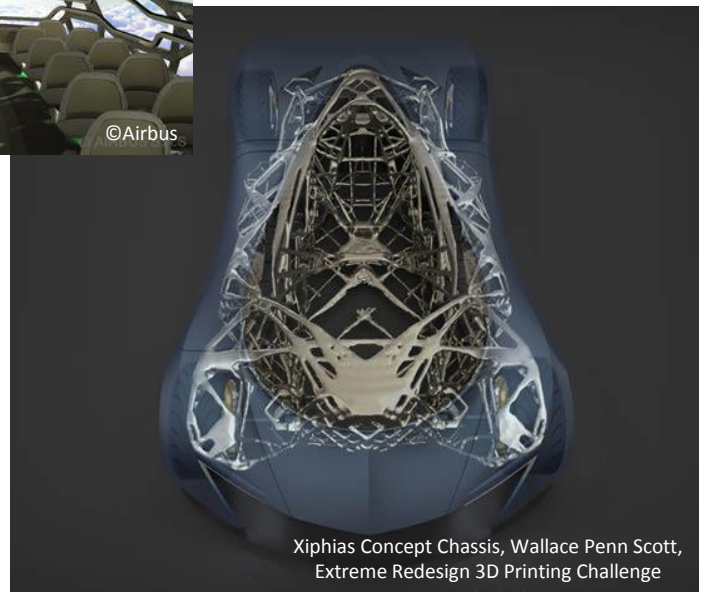




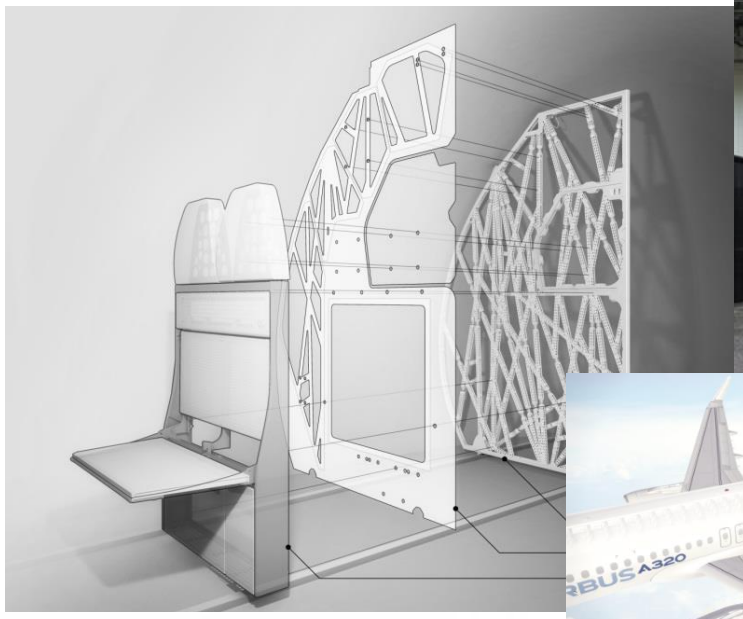


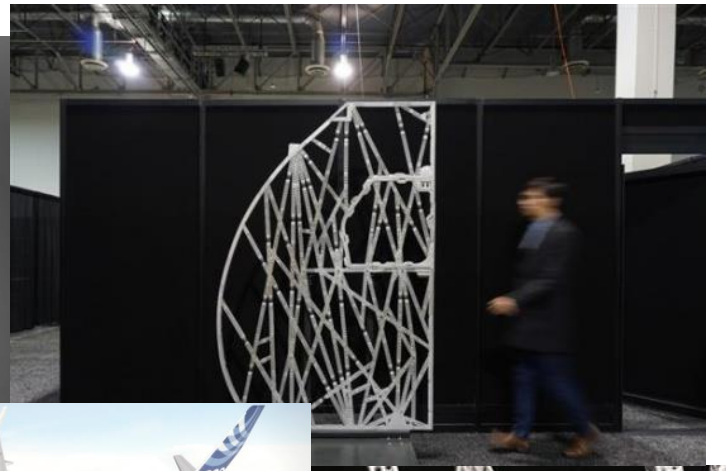


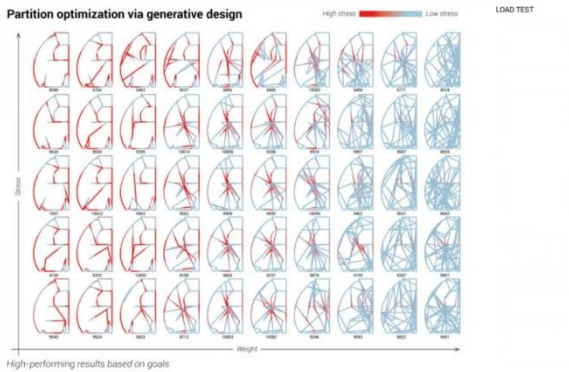
Altair Engineering GmbH

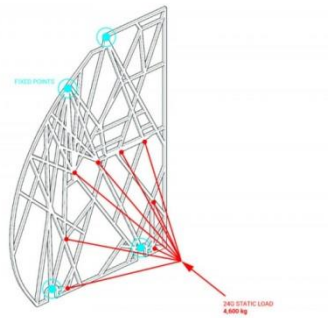


Xiphias Concept Chassis, Wallace Penn Scott, Extreme Redesign 3D Printing Challenge









45%

Lighter

30 kg

Less mass

Scalmalloy

Special alloy for AM

Source: http://www.thelivingnewyork.com/

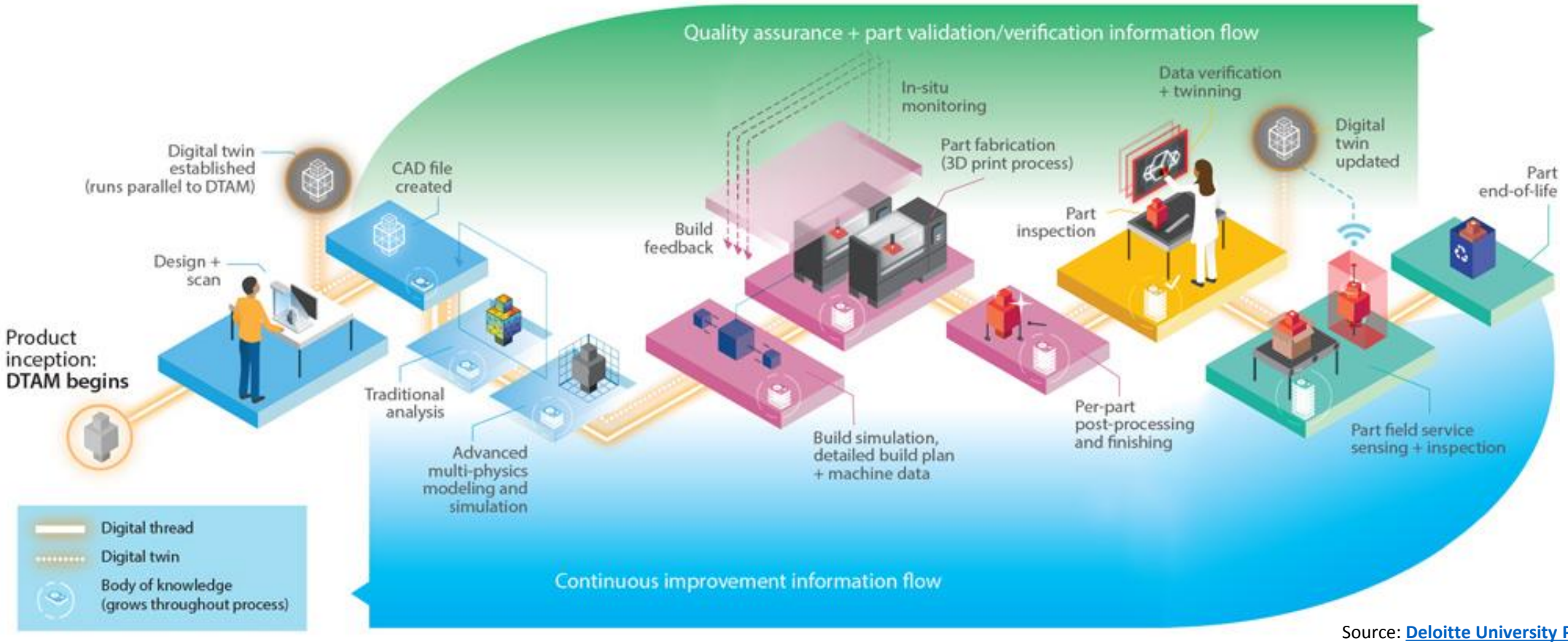
Material suppliers	Material distributors	Equipment OEMs	Design/ Engineering	Service providers	Post-processing	End customers
AP&C ADVANCED POWDERS & COATINGS	LPW	CONCEPTLASER hofmann innovation group	DASSAULT SYSTEMES	Delotte	BINC INDUSTRIES	GE Aviation
ALCOA	colorFabb	eos e-Manufacturing Solutions	AUTODESK	LINEAR MOLD & ENGINEERING	POSTPROCESS	SIEMENS
ATI	3DCenter YOUR IDEA IN OUR DIMENSION.	3DSYSTEMS	netFabb Software for 3D Printing	3T		BEGO
EASTMAN	LSS Additive Manufacturing Solutions	stratasys	Materialise innovators you can count on	LayerWise		NIKE
H.C.Starck		CAD TO METAL arcam Arcam AB		Materials Solutions		BMW
oerlikon metco		SLM SOLUTIONS		citim		BAKER HUGHES
BASF We create chemistry		TRUMPF		FIT		Medtronic
CARPENTER				POLY-SHAPE		BOEING
						LOCKHEED MARTIN

Key players invest into AM for production:

AIRBUS SIEMENS TRUMPF MICHELIN fives SAFRAN AEROSPACE · DEFENCE · SECURITY DASSAULT SYSTEMES

Source: Boston Consulting Group

SCAN/ DESIGN + ANALIZE | **3D-PRINT + MONITOR** | **TEST + VALIDATE** | **DELIVER + MANAGE**



Source: [Deloitte University Press]

Desktop low-end 3d-printers

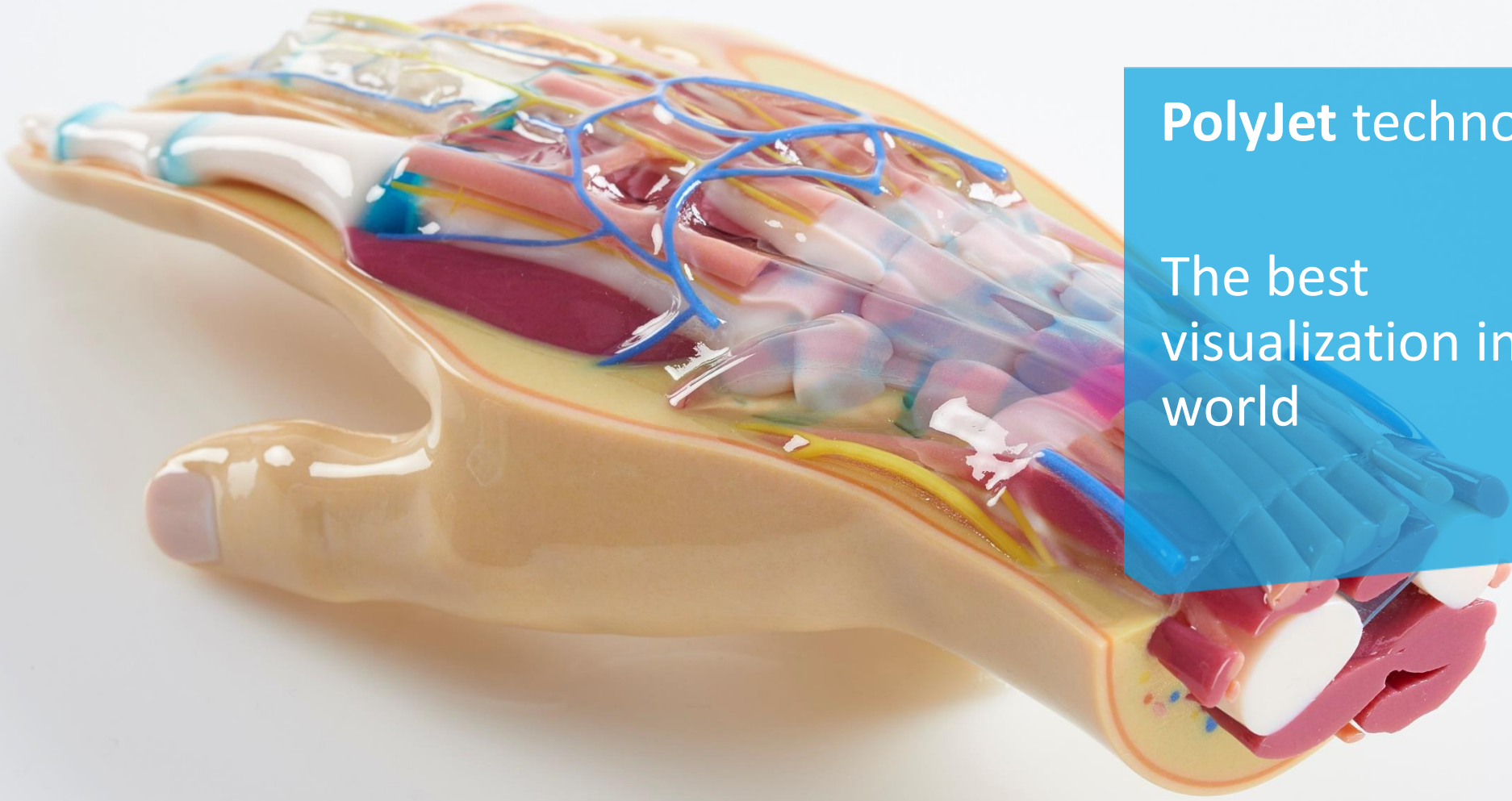
Desktop professional 3d-printers

Professional 3d-printers

Production systems

Industrial Production Modules

Conceptual modeling | Functional testing| End-use parts and tooling



PolyJet technology

The best visualization in the world

PolyJet technology

Manufacturing aids & tooling

FDM technology

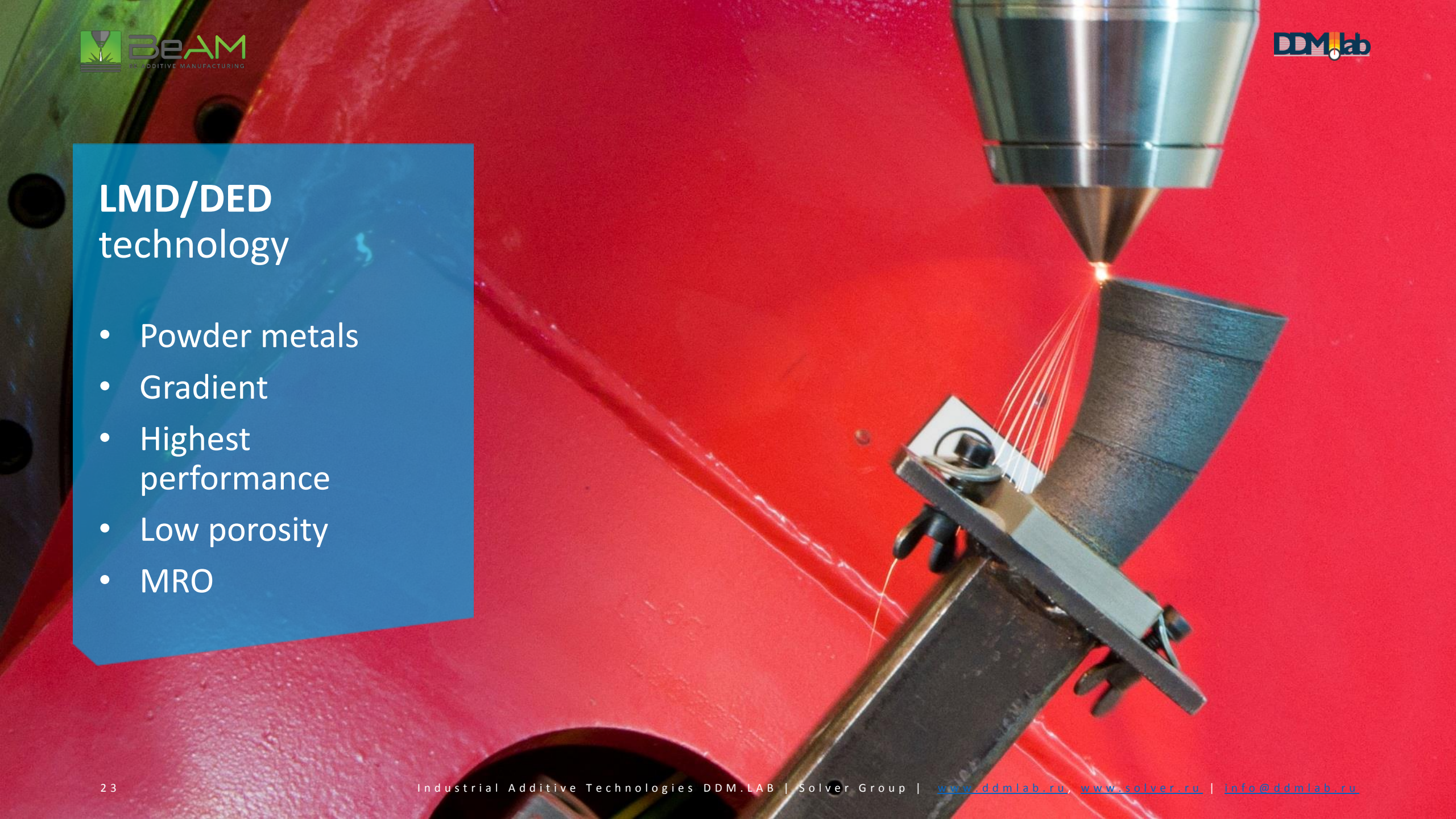
- Manufacturing aids, tooling & end-use parts
- The most universal and most copied technology in the world

FDM technology

- Dimensions
- Accuracy
- Repeatability
- Hi-end production plastics and composites
- Real environment testing

FDM technology

- Automation
- Multimaterial properties
- Scalability
- Reliability

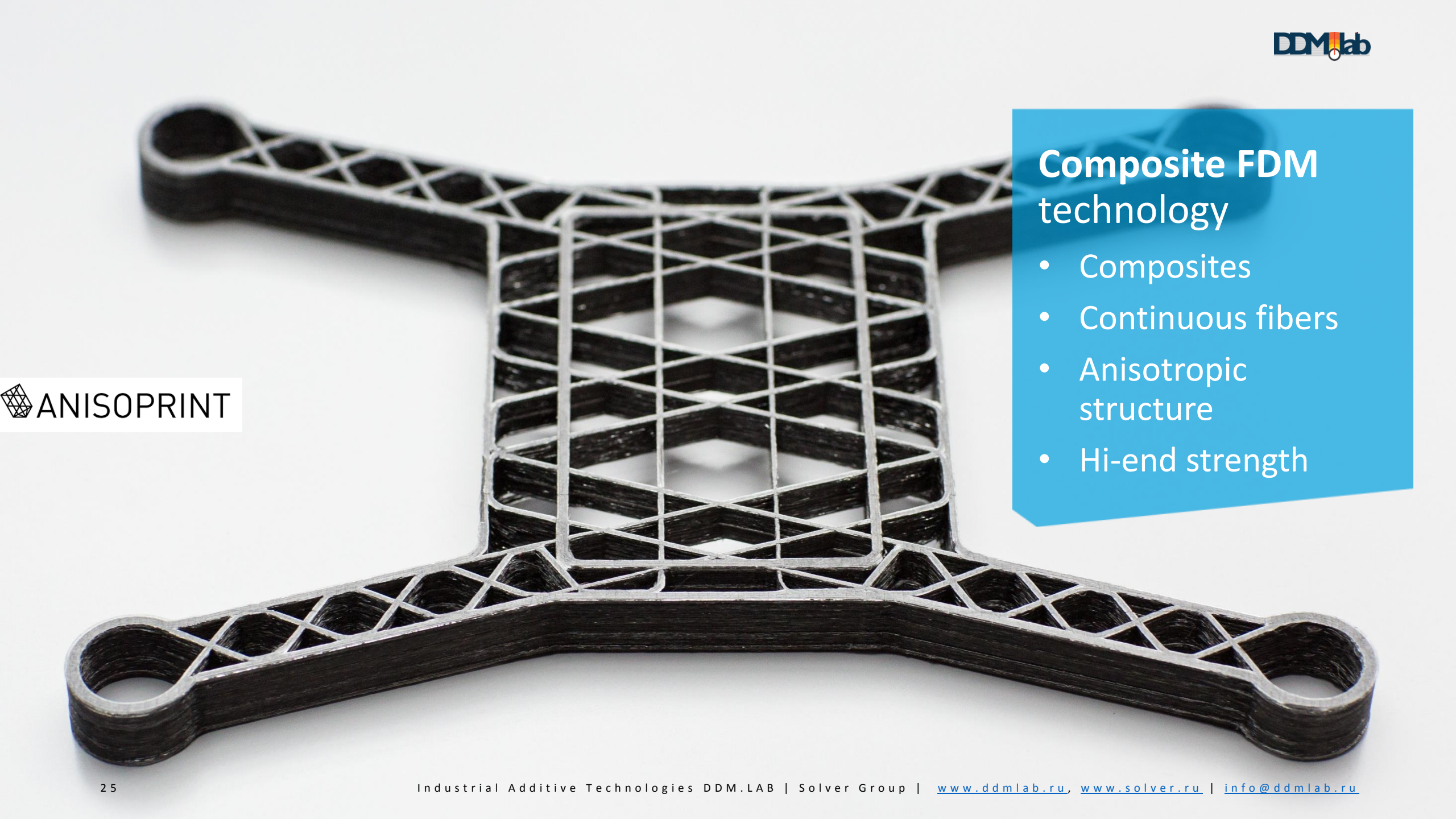


LMD/DED technology

- Powder metals
- Gradient
- Highest performance
- Low porosity
- MRO

SLM technology

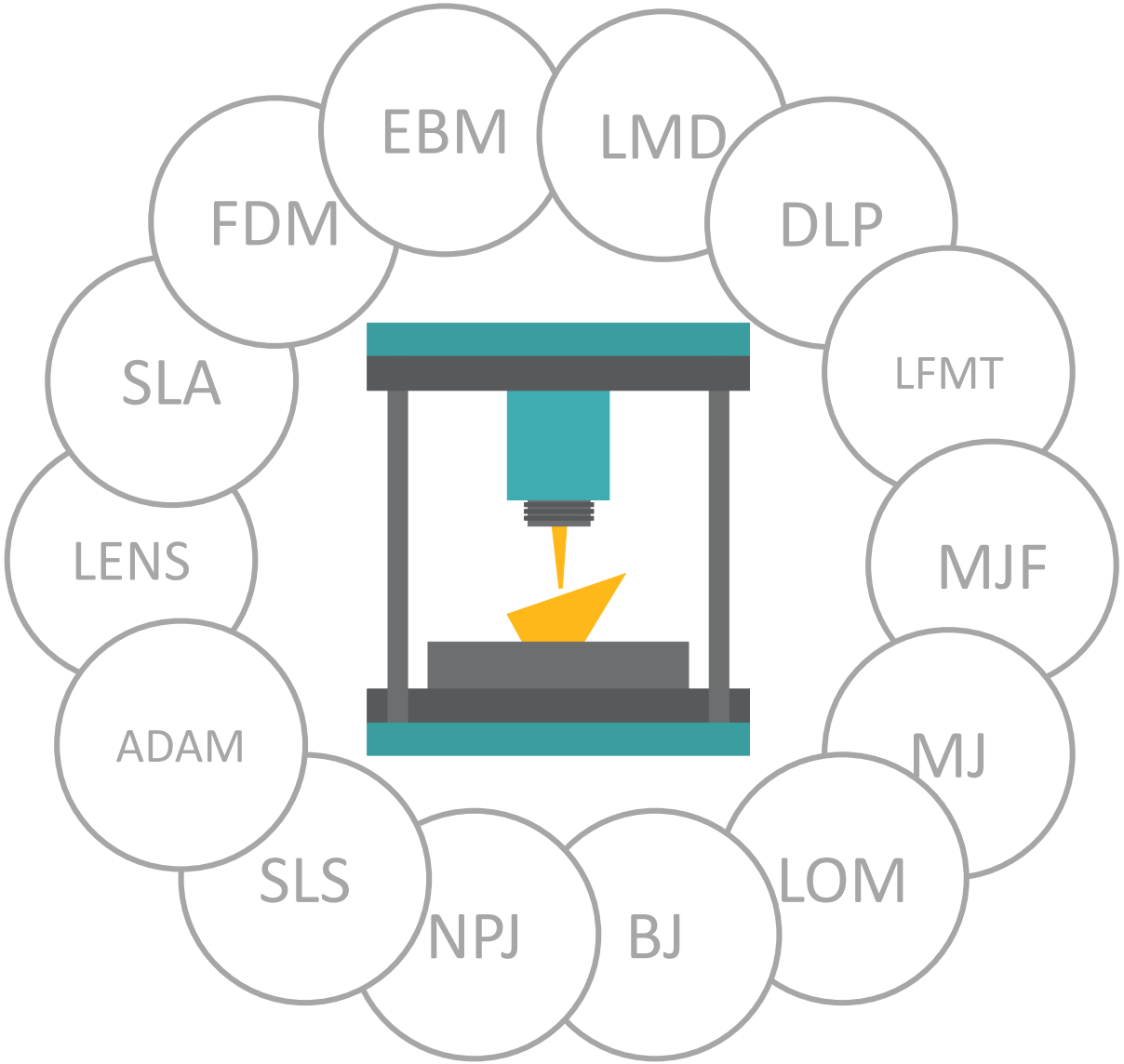
- Powder metals
- HQ, better than casting
- End-use parts («flying» ready)

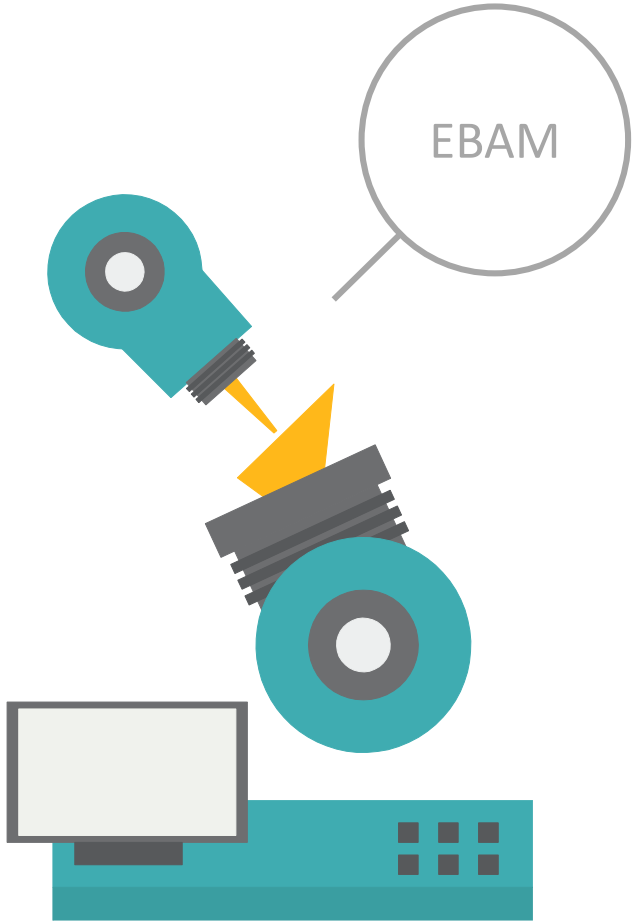


ANISOPRINT

Composite FDM technology

- Composites
- Continuous fibers
- Anisotropic structure
- Hi-end strength





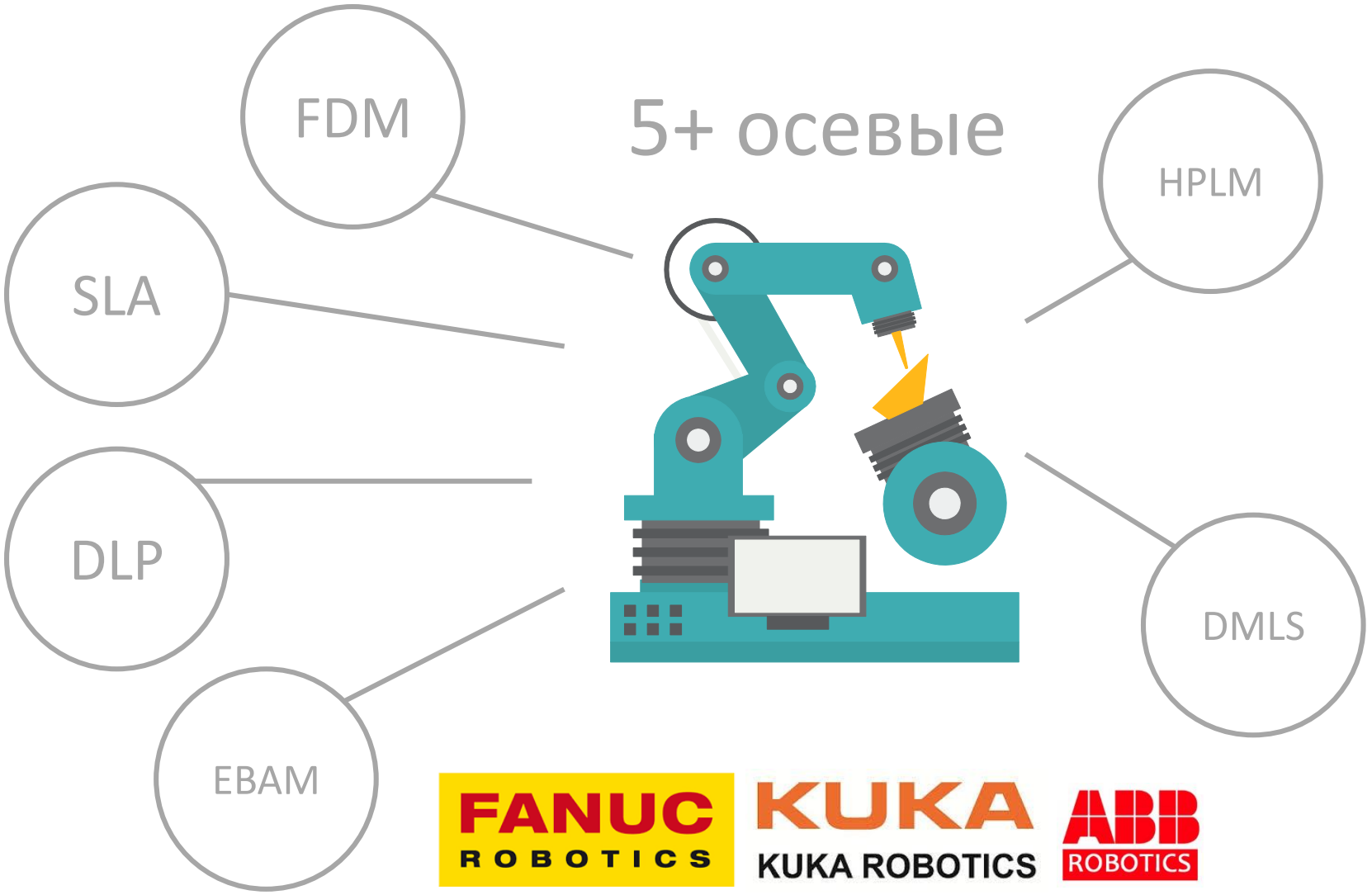
Cyber physical

Modular

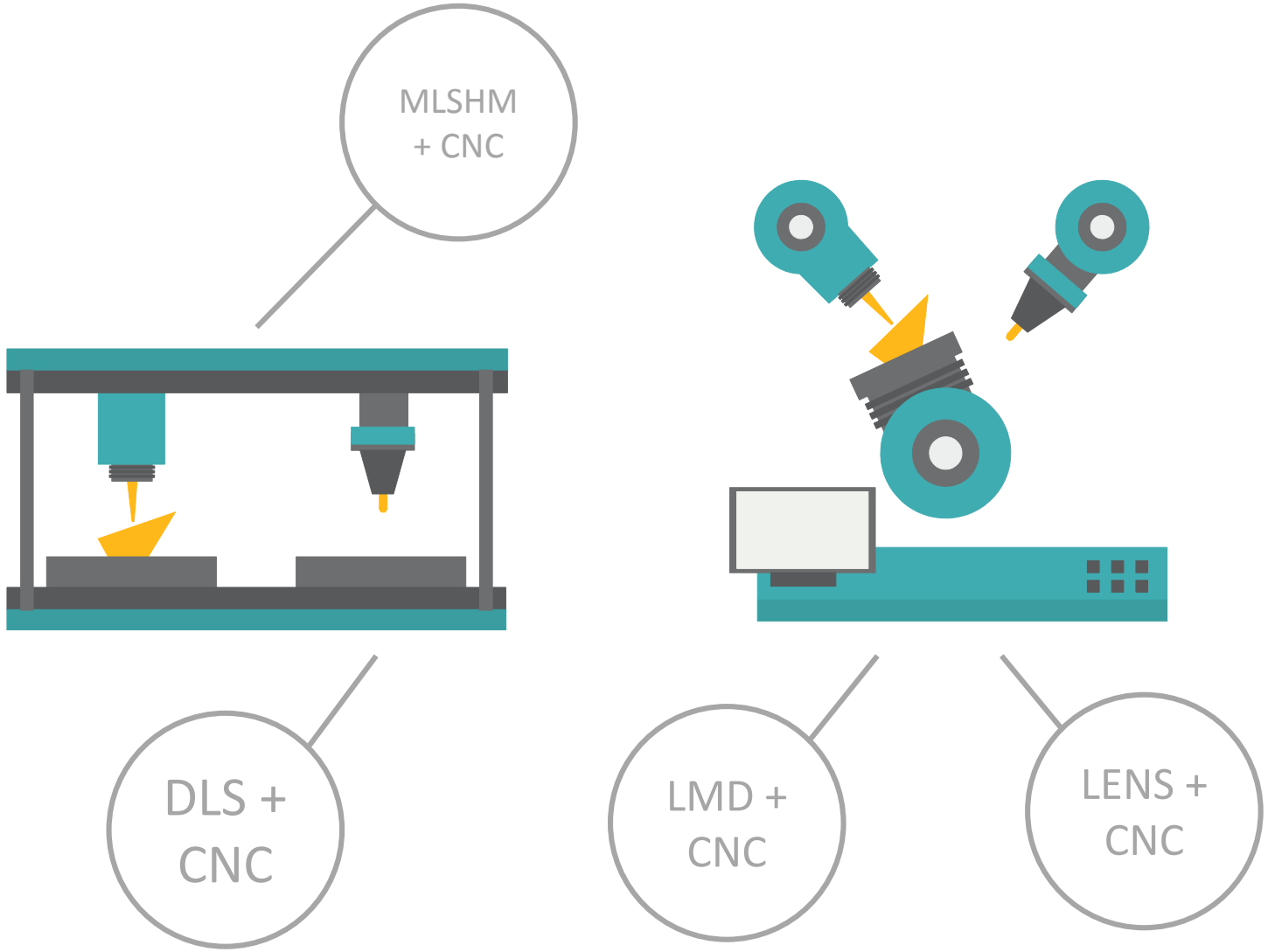
Hybrid

Robotic Systems

Individual



Cyber physical
Modular
Hybrid
Robotic Systems
Individual



Cyber physical

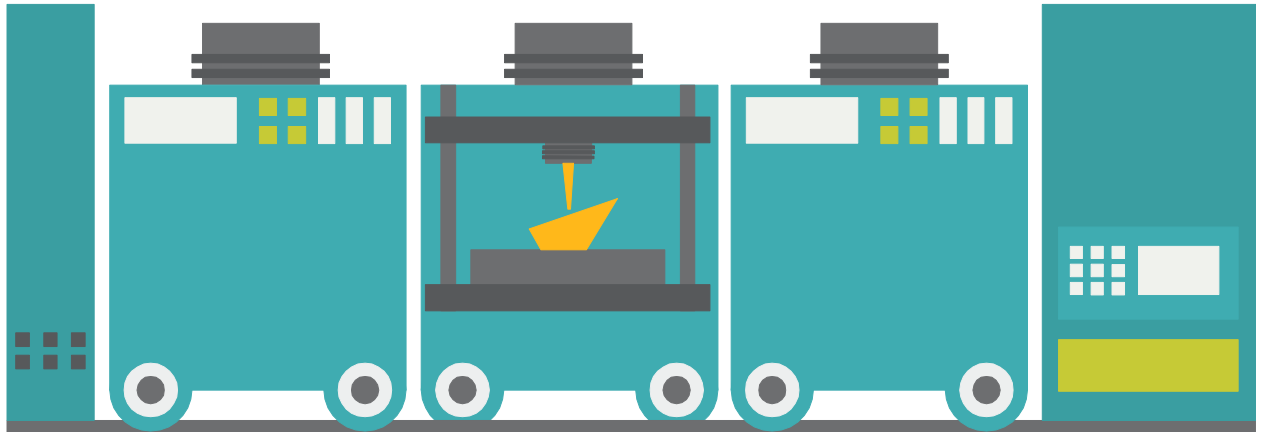
Modular

Hybrid

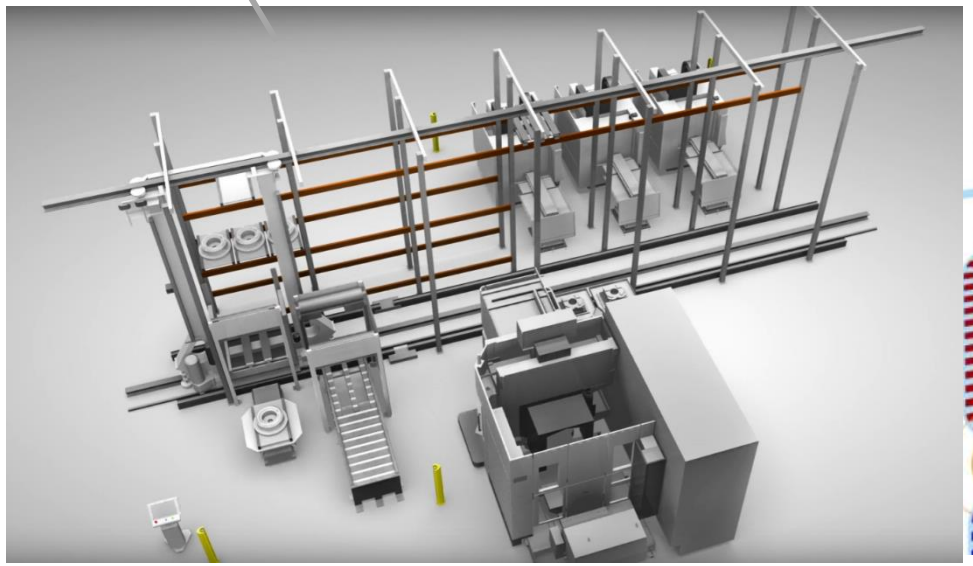
Robotic Systems

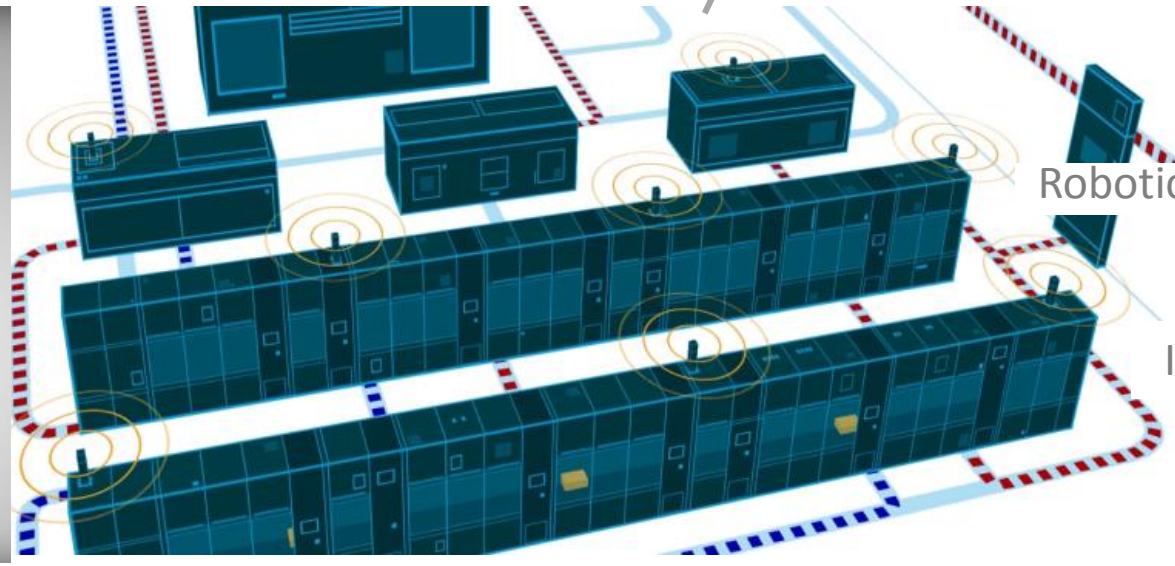
Individual

LFMT



SLM





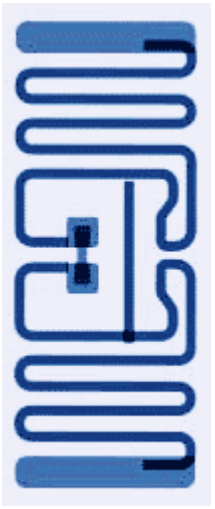
Cyber physical

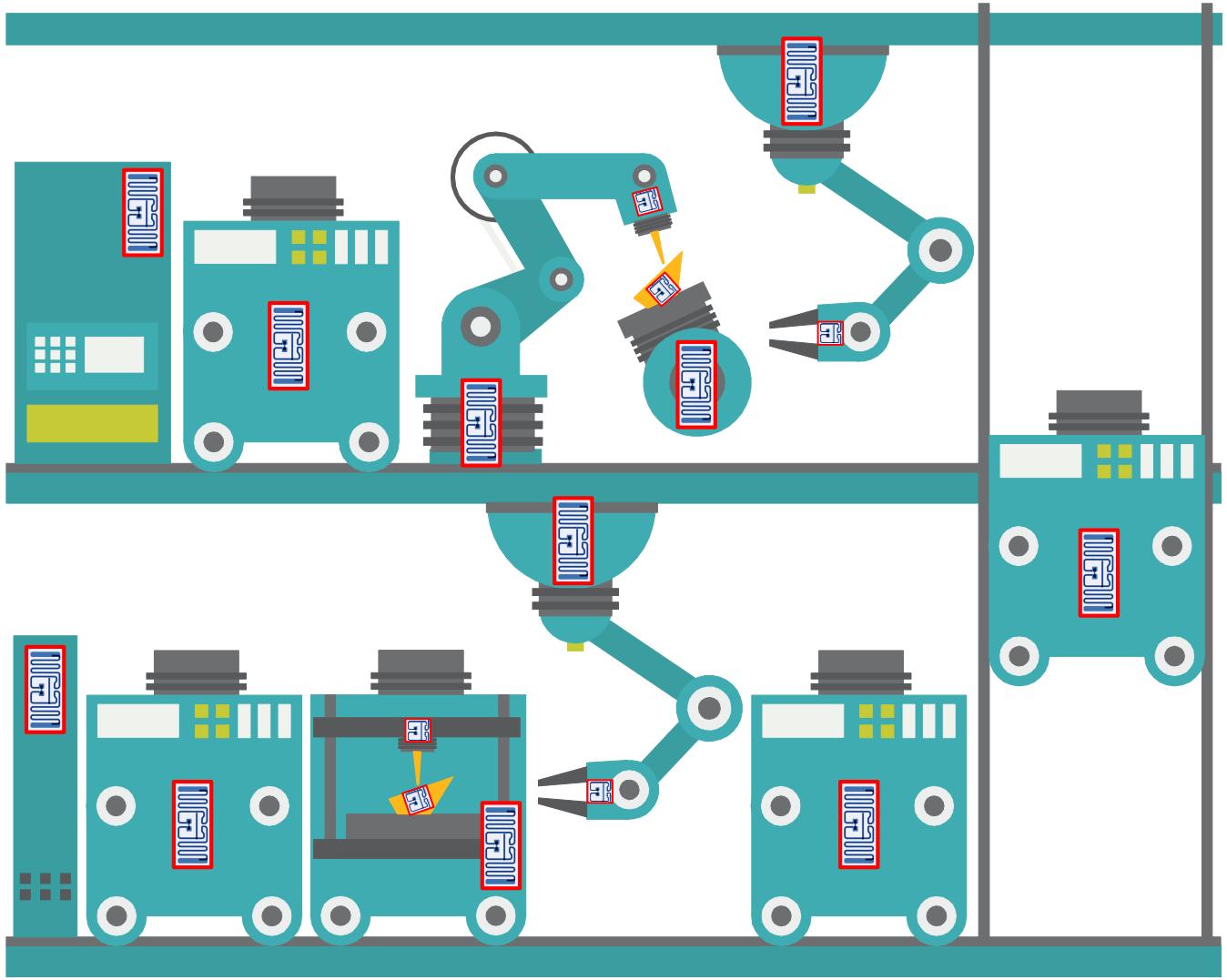
Modular

Hybrid

Robotic Systems

Individual





Cyber physical

Modular

Hybrid

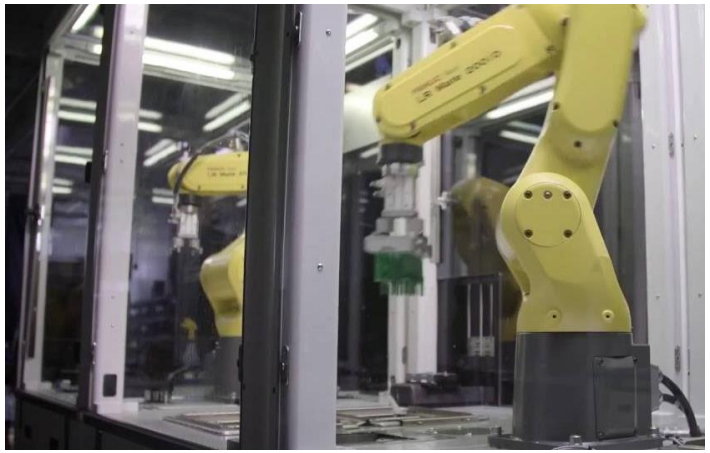
Robotic Systems

Individual

Digital factories today

Numerous service providers around the world

3D Systems | SLAbot-2 |



Coobx | LIFTcell

ARBURG

Formlabs | Form Cell 3D

Additive manufacturing of large tools and production parts

INFINITE-BUILD 3D DEMONSTRATOR

Fabricating composite structures with strength in every direction

ROBOTIC COMPOSITE 3D DEMONSTRATOR

Scalable, Additive Manufacturing Array, Cloud Connected Infrastructure for Continuous Production

In'Tech

Savannah College of Art and Design

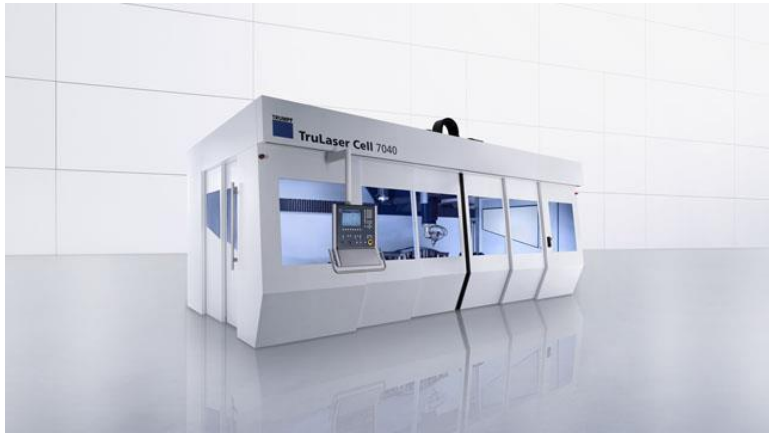
FATHOM

STRATASYS CONTINUOUS BUILD™ 3D

- «Advanced» extrusion
- Reliability
- Repeatability
- Speed
- Hybrid production
- Mass production
- Scalability/Array
- Automation
- Multi-materiality
- Cloud Connected Infrastructure

Concept Laser

Trumpf | TruLaser Cell

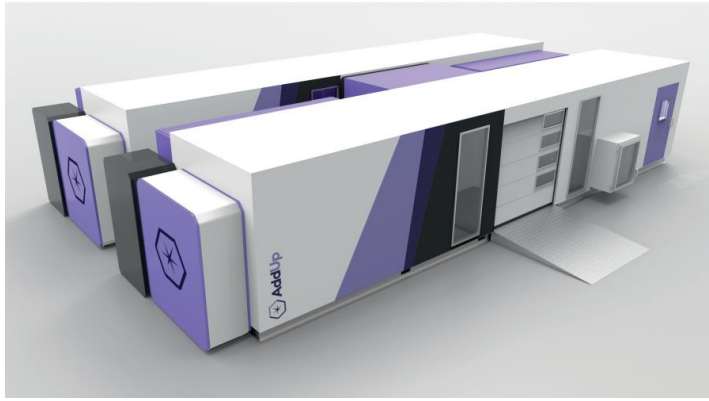


SLM 800HL

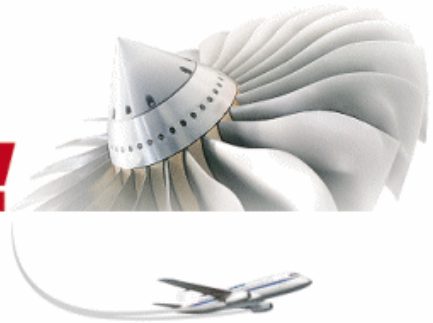
EOS

Additive Industries | MetalFAB1

AddUp | Flex Care System



САТУРН
НАУЧНО-ПРОИЗВОДСТВЕННОЕ ОБЪЕДИНЕНИЕ



АВИАДВИГАТЕЛЬ

ВИАМ

12+

3D printing machines currently in use

Photo courtesy Lockheed Martin Space Systems

80%

Time reduction to manufacture a tank

100+

3D printing machines currently in use

55%

Lost cost

3-9 kg in hour
5,8 meters long

75%

Reduction in waste

The 3D printed titanium propulsion tank

500+

Factories worldwide

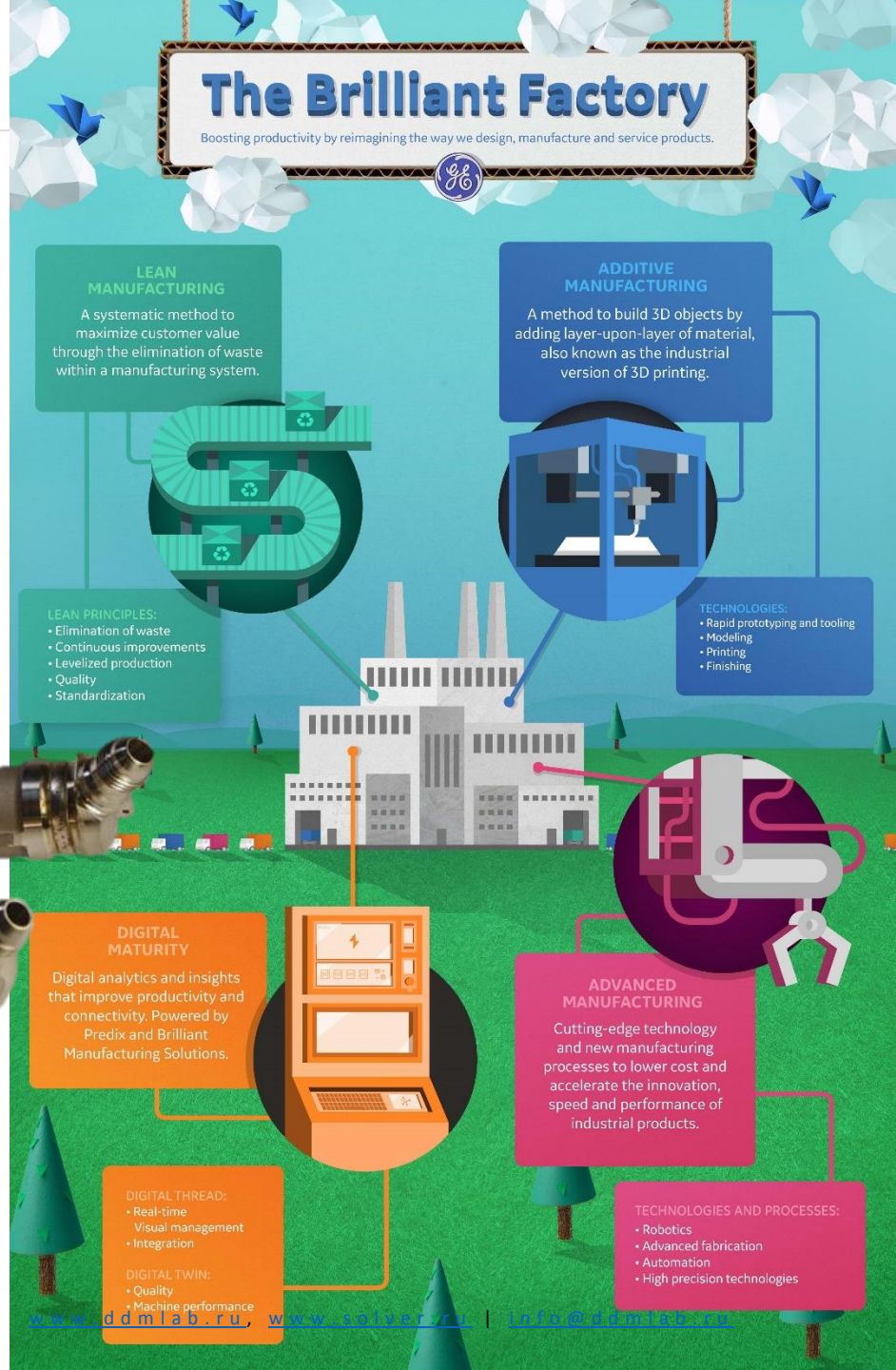
100K

Additive parts will be manufactured by GE Aviation by 2020

400+

3D printing machines currently in use across GE

3D-printed fuel nozzle for the LEAP (CFM International)



Source: GE Brilliant Factory

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СОЛВЕР
ГРУППА КОМПАНИЙ

СОВРЕМЕННОЕ ОБОРУДОВАНИЕ