



Strategic Command  
Defence Support

# Additive Manufacturing as a Service

Collaborative Working Groups

19 March 2024





# NUCLEAR AMRC

ADVANCED MANUFACTURING RESEARCH CENTRE

- **Welcome**
- Tom Purnell Business, Development Director, Nuclear AMRC
- 19th March 2024

# • Health & safety

## Nuclear safety culture

The safety of our staff and visitors is our number one priority.

- Human performance.
- Risk assessment.
- Hazard awareness.

## Health & safety personnel

- Trained first-aiders.
- Fire marshals.

March safety message:

## Are your safe systems of work valid for use?

All work activities should be covered by a risk assessment and method statement, which must be:

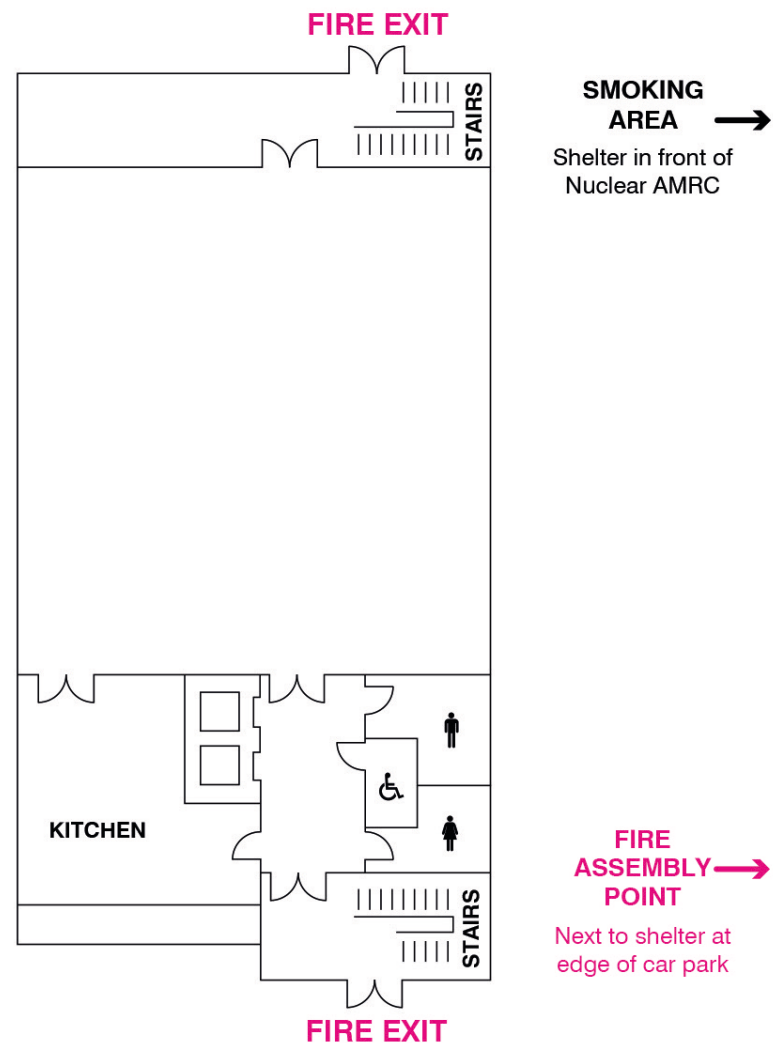
- Up to date.
- Accurate & sufficient.
- Approved.
- Acknowledged by staff.



- Visitor health & safety – KTC

Fire safety

- No fire alarm test planned.
- Assemble in front of building.
- Fire exits at both sides of the building.



## • Our mission

To help UK companies win work in nuclear.

- New build
- Operations
- Decommissioning
- Advanced technologies
- Defence

## Our vision

A vibrant and innovative nuclear sector that delivers clean energy and secures the nation's future growth and prosperity.





## • Raising your capabilities

### Manufacturing innovation

- Improving cycle time and quality.
- Reducing lead time, cost and risk.
- Developing innovative techniques and technologies.

### Supply chain and skills development

- Raising quality, capability, cost competitiveness and skills.
- Helping companies meet nuclear industry requirements and expectations.

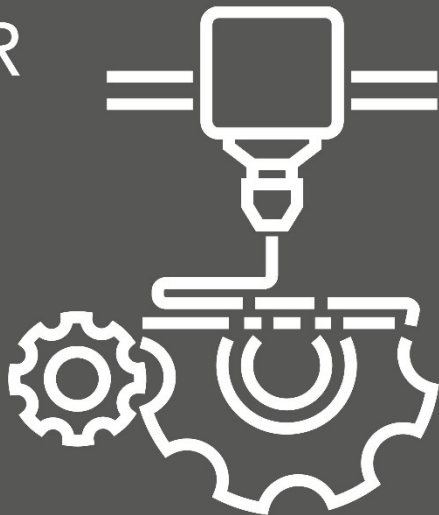


# Impact & KPIs



**5,701**  
business  
interactions

April 2018 – December 2023



**4,051**  
SME  
engagements

April 2018 – December 2023



**513**  
academic  
engagements

April 2018 – December 2023





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# Agenda & Objectives for the Day

Edit Barbantan

09:40 – 09:45





**09:00 Arrival – Tea & Coffee**

09:30 Welcome & Housekeeping

09:40 Agenda and Objectives for the Day

09:45 Executive Group Welcome & priorities for 2024

10:00 Annual Survey Review

10:05 Team Defence Info Brief

10:15 Kaizen PLM, Siemens & AMRC presentations

**11:15 Coffee break**

11:45 Overview of successful S2 proposals

12:00 Stalls: Spiral 2 Stalls part 1

**13:00 Lunch + tour**

14:00 Stalls: Spiral 2 Stalls part 2

15:00 Working Group Meetings

16:00 WG Co-Chair Summaries & Wrap-up

**16:30 Close**



**Aim:** Kick off the Additive Manufacturing as a Service collaborative Working Groups for 2024

**Objectives:**

1. Outline the Executive Group priorities for 2024.
2. Highlight the key findings from the Annual Review Report and the Pulse Survey.
3. Present Spiral 2 parts.



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# Executive Group Welcome

Charlotte Robinson

09:45-10:00



## AdM Exec Group

### Co-Chairs

Charlotte Robinson – (MOD DefSp Innovation)

Jon Morley – (Industry - Babcock)

Sec – Edit Barbantan (MOD DefSp Innovation)

DIPR Representatives - Nathan Sluman & Georgina Bowyer

MTC Representative – Ross Trepleton

Oversight, Direction, Coherence

Attended by Workstream leads/co-chairs

IPR Working Group  
DSF Commercial

AdM Certification  
Working Group

AdM Inventory Management  
Working Group

AdM Digital Thread  
Working Group

## Integration Task Force

### Co-Chairs

Nigel Stewart (BAeS) – (Ind)

Phil Tozer - (DE&S)

Sec – Hannah Weir (MOD)

### Co-Chairs

Charlotte Meeks (Industry – QinetiQ)

Gp Capt Leonie Boyd (MOD Air Cmd)

Sec – Stu Olden (Industry – TD Info)

### Co-Chairs

Len Pannett – (Industry – DiManEx)

Guy Hargreaves – (MOD LSOC)

Sec – Stu Olden (Industry – TD Info)

### Co-Chairs

Shelley Copplestone – (Industry - Babcock)

Lt Cdr Timothy Westmaas – (MoD)

Sec – Edit Barbantan (MOD DefSp Innovation)

- Unlock IPR constraints for obsolete/obsolescent parts
- Unlock IPR for current parts

- LFE with Aerospace
- Agree standards
- Agree processes
- Agree protocols

- Consider implications for Matl accounting
- Consider if needed to be flagged on Sp IS
- Check fit, form and function alignment with extant NSN

- Print file creation
- Print file standards
- Print file storage
- Print file transmission
- Print file exploitation



#	Objective	% Complete	Measures of Success
1	Commission Spiral 1 & 2		<ul style="list-style-type: none"> <li>a. ✓ Place Spiral 1: Contacts placed 28 Mar.</li> <li>b. ✓ Place Spiral 2: CDLS direction to prioritise parts used on UKR gifted platforms.</li> </ul>
2	Outline a scalable end-to-end process for the use of AdM on non-safety critical parts within the Defence supply chain		<ul style="list-style-type: none"> <li>a. ✓ Establish collaborative integration “task force”</li> <li>b. Provide evidence of use of Spiral 1 examples</li> <li>c. Identify conditions for expansion to wider inventory and platform types – crossing all WG constraint areas and identifying potential risks &amp; bottlenecks</li> <li>d. Provide evidence of minimal friction approach without reinventing processes/ procedures</li> <li>e. Provide evidence of future proofing for other advanced manufacturing techniques</li> <li>f. Assess against approach used by allies (scalability highlighted as key challenge for US DoD)</li> </ul>
3	Bring in new stakeholder support from MOD/ industry		<ul style="list-style-type: none"> <li>a. ✓ Recruit new Industry Co-Chairs for Certification WG and Exec Group</li> <li>b. ✓ Develop key stakeholder list &amp; identify gaps (WG Secretaries &amp; HVM Centre of Expertise)</li> <li>c. ✓ Establish closer links with new key areas (Defence Digital, DSF Commercial)</li> <li>d. ✓ Hold WG events at different locations to inspire new stakeholders to join the effort</li> </ul>
4	Deliver on the action plan from the Annual Review 22 & Nov 22 “hot topics”		<ul style="list-style-type: none"> <li>a. ✓ Establish Pan-Defence owner to enable coherence – Defence Support lead through EST</li> <li>b. ✓ Demystify accredited supplier process – “Doing Business with Defence” uploaded to Kahootz, including the SME Action Plan and instructions for how non-MOD staff can access the KiD.</li> <li>c. ✓ Build education on additive and advanced manufacturing into WGs and HVM COE plans.</li> <li>d. ✓ 7/7 actions now closed.</li> </ul>
5	Maintain the positive relationships & momentum generated last year		<ul style="list-style-type: none"> <li>a. ✓ Build networking opportunities into F2F WG agendas</li> <li>b. ✓ Build interactions at least every 2 months in hybrid WG schedule</li> <li>c. ✓ Provide evidence of collaboration and information sharing of Spiral 1 and 2 findings</li> <li>d. ✓ Measure through the Annual Review – <b>Update from Edit today</b></li> </ul>



#	Objective	% Complete	Measures of Success
1	<b>Complete Spiral 1 &amp; Kick Off Spiral 2</b>		<ol style="list-style-type: none"> <li>1. Completion of all 5 Spiral 1 tasks: latest task due to complete Aug 24.</li> <li>2. ✓ Kick Off of Spiral 2: Kick Off meetings Mar 24.</li> <li>3. Delivery of Spiral 2: initial lessons from Spiral 2 by Autumn 24.</li> </ol>
2	<b>Preparing the ground to scale the use of AM within the Defence supply chain</b>		<ol style="list-style-type: none"> <li>1. Complete integration task force deliverables:               <ol style="list-style-type: none"> <li>a. Outline of end-to-end AM process and checklist released</li> <li>b. Update ILS policies for obsolescence management and Def Standards to accommodate AM</li> </ol> </li> <li>2. Provide WG assumptions list from MOD internal vision paper</li> <li>3. Capture the MOD Inventory onboarding process for AM parts via DE&amp;S Strategy Team</li> <li>4. ✓ Secure new Pan-Defence AM owner to accelerate adoption of AM and address cross-DLOD issues – DJS secured</li> <li>5. Set up AM Info Systems Capability Planning Working Group – Capability Investigation due to deliver Summer 24</li> <li>6. Manage AM Next Steps following EST closure e.g. what next for the Parts Creation Solution</li> </ol>
3	<b>Bring in new stakeholder support from DE&amp;S and international stakeholders to share learning to accelerate AM adoption</b>		<ol style="list-style-type: none"> <li>1. ✓ Learning from Experience Event with DE&amp;S Jan 24</li> <li>2. ✓ DE&amp;S Graduate and Apprentice Day Feb 24</li> <li>3. ✓ Include DE&amp;S Delivery Team Representatives in all Spiral checkpoint and kick off meetings</li> <li>4. Continue Defence Availability Centre engagement</li> <li>5. Agree &amp; implement, via Defence Hd of Materiel Accounting, the correct capitalisation treatment of AM parts</li> <li>6. US DoD Visit Apr 24</li> <li>7. ✓ German Navy invitation to WGs</li> </ol>
4	<b>Provide MOD/ Industry collaborative inputs into the pre-Spiral 3 &amp; 4 MOD Decision Point by 31 May</b>		<ol style="list-style-type: none"> <li>1. Lessons from Spiral 1 and 2 to date identified</li> <li>2. Feedback on Pj TAMPA Framework</li> <li>3. Feedback on ideas for future spirals</li> <li>4. Feedback from Annual Review 23 and Pulse Survey to date</li> </ol>
5	<b>Maintain &amp; build on the positive relationships &amp; momentum generated last year</b>		<ol style="list-style-type: none"> <li>1. Deliver on Annual Review 23 findings &amp; action plan</li> <li>2. Build networking opportunities into F2F WG agendas and vary locations around the UK &amp; organisations</li> <li>3. Build interactions at least every 2 months in hybrid WG schedule</li> <li>4. Information sharing, using Kahootz as means to share artefacts e.g. OA Tasker redacted report</li> <li>5. Measure through the Annual Review and Ongoing Pulse Survey</li> </ol>



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# Annual Survey Review

Edit Barbantan

10:00 – 10:05



**5 individual Annual Survey responses. 44 Pulse Survey Responses.**

**Identified themes:**

- Standards
- *Qualification and certification*
- Frontline focus
- Technology insights
- Impact of Delays
- Feedback loop not closed
- Potential ideas for Spirals 3 & 4
- Sustainability of AM
- Misinformation
- Knowledge sharing
- International engagement
- Networking and collaboration opportunities

**Action plan for Summer 24**





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# Team Defence Info Update

Stu Olden

10:05 – 10:15

# AdM Knowledge Capture Matrix (update)

Stu Olden

March 2024

# Background & Objective

## Task Mandate:

- Recommendation from AdM Inventory task, supported by HVM COE & Def Sp.

## Delivery:

- AdMaaS Certification SWG, part of Certification Roadmapping activities.

## Objective:

- This task seeks to **capture the extent of the UK based capabilities** for manufacturing **metal AdM parts** for Defence supply chain.
- **Team Defence Information (TDInfo) are supporting the AdMaaS Cert SWG**, by engaging with industry to **understand the range of material, machines & processes for manufacturing metal AdM parts.**
- Last briefed at previous AdMaaS WG (DMC, Silverstone)

## Task activities: Questionnaire

# KCM Questionnaire

## Additive Manufacturing Capabilities Knowledge Capture

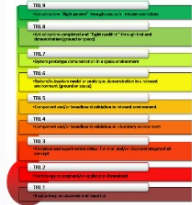
Guide

**Manufacturing Readiness Level (MRL)** is a quantitative measure of the maturity of a given technology, component or system from a manufacturing perspective.

**Technology Readiness Level (TRL)** is a quantitative measure of the maturity of a given technology.

**Manufacturing Readiness Level (MRL)**

Phase:	MRL:	Status of Development:
Phase 3: Production Implementation	9	Full production process qualified for full range of parts and full metrics achieved
Phase 2: Pre production	6	Capacity and rate confirmed Process optimized for production rate or production equipment Basic capacity demonstrated
Phase 1: Technology assessment and prototyping	3	Production validated in lab environment Experimental proof of concept completed Application and validity of concept validated or demonstrated Concept proposed with scientific evidence



**Material Availability** is a measure of the lead time in acquiring the required material for part manufacture:

**Part Criticality** is a measure of the importance of a part and consequence of part failure.  
For a car this may be:

- 3: Wheel, Chassis or Windscreen (Fail deadly - Large Impact)
- 2: Wheel bearing, CV Joint (Fail Safe - Medium Impact)
- 1: Paint, Wing/Mirror, Radio (Fail Safe - Low Impact)

**Capability 1**

Manufacturing Process

You must provide an answer to this question.

Please enter any additional comments

**Material and lead time.**

Please select those that are applicable to this process.

Select the most applicable option in each row. You must select an option in at least 1 row.

	Short Lead Time (0-4 weeks)	Medium Lead Time (4-12 weeks)	Long Lead Time (12-24 weeks)
Stainless Steel - Austenitic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stainless Steel - Ferritic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stainless Steel - Duplex	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Steel - High Strength Steels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Steel - Medium/Low Strength Steels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aluminium	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Titanium	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nickel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Copper Alloys	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Knowledge Capture Parameters:

- AM Process
- Material availability
- Manufacturing Readiness Level
- Technology Readiness Level
- Part Criticality

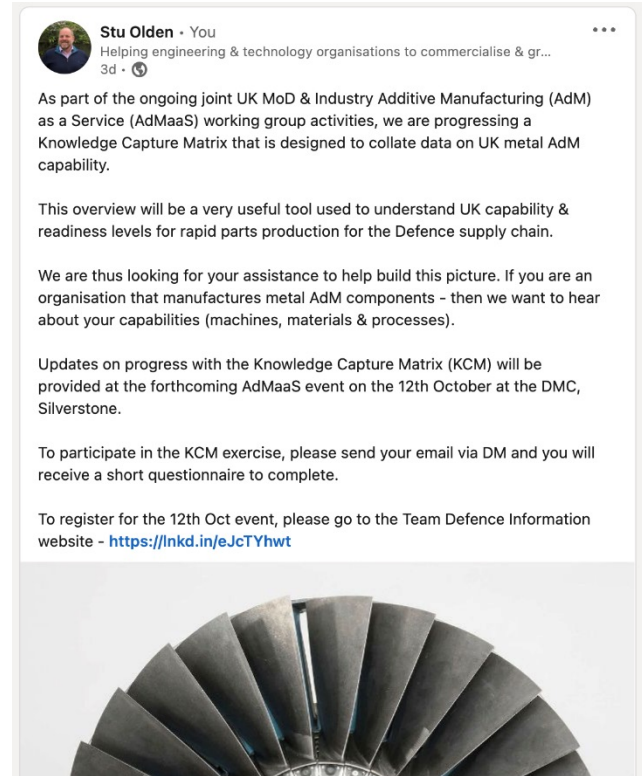


AdM Capability Survey

## Task activities: Engagement Activity

# Engagement activity

- Questionnaire signposted to all AdMaaS WG delegates (email)
  - Questionnaire sent out companies identified through AMUK
  - Posts on LinkedIn
  - Team Defence Information Bulletins
- 
- **Email: [Stu.olden@teamdefence.info](mailto:Stu.olden@teamdefence.info)**



**Stu Olden** · You  
Helping engineering & technology organisations to commercialise & gr...  
3d · 🌐

As part of the ongoing joint UK MoD & Industry Additive Manufacturing (AdM) as a Service (AdMaaS) working group activities, we are progressing a Knowledge Capture Matrix that is designed to collate data on UK metal AdM capability.


This overview will be a very useful tool used to understand UK capability & readiness levels for rapid parts production for the Defence supply chain.

We are thus looking for your assistance to help build this picture. If you are an organisation that manufactures metal AdM components – then we want to hear about your capabilities (machines, materials & processes).

Updates on progress with the Knowledge Capture Matrix (KCM) will be provided at the forthcoming AdMaaS event on the 12th October at the DMC, Silverstone.

To participate in the KCM exercise, please send your email via DM and you will receive a short questionnaire to complete.

To register for the 12th Oct event, please go to the Team Defence Information website - <https://lnkd.in/eJcTYhwt>



# Response & Benchmarking

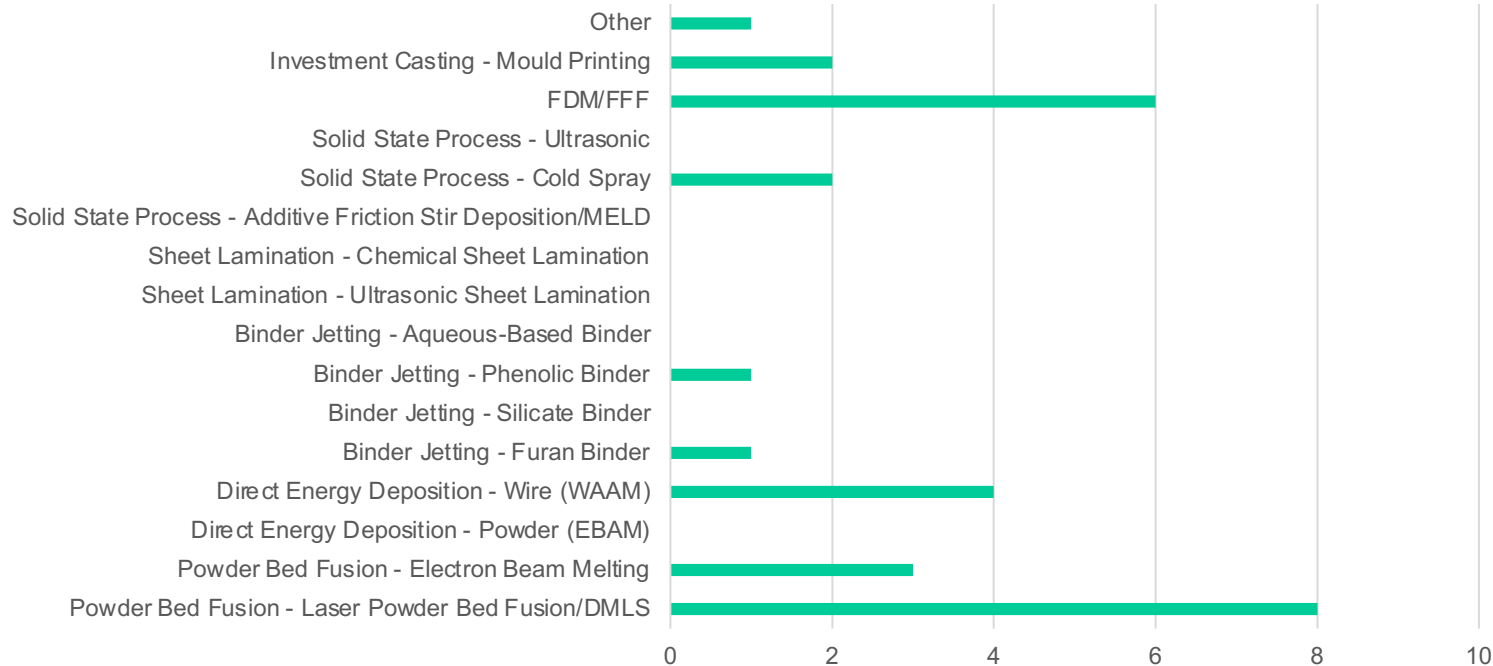
- Of the 89 companies contacted directly **16 responded (18% response rate)**
  - **Further 5 responded via direction from other sources** (LinkedIn, Bulletin, etc)
- OEMs that responded:
  - Thales
  - Leonardo Helicopters
  - Babcock
- Other directories exist, but these offer limited information on capability (generally signpost to company websites)
  - TCT Directory
  - AMUK
  - Additive News
  
  - The US based 'SENVOL' database is a good exemplar (<http://senvol.com/>) but US focused
  - AMFG's Additive Manufacturing Landscape 2020 contains some excellent data, but needs updating (<https://amfg.ai/2020/05/26/the-additive-manufacturing-industry-landscape-2020-231-companies-driving-digital-manufacturing/>)



## Task activities: Response Analysis

# Response Analysis (Processes)

No. of company with process capability

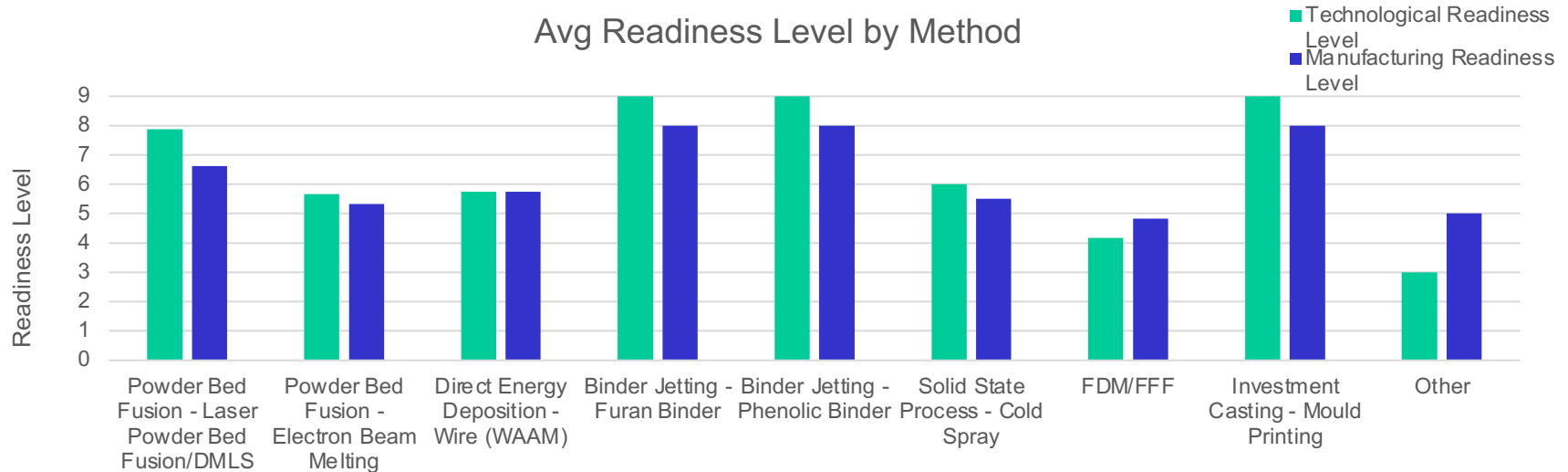


'Other' = Lithography-based Metal Manufacturing (LMM)

Investment Casting is not strictly a Metal AdM process

# Response Analysis (MRL/TRL)

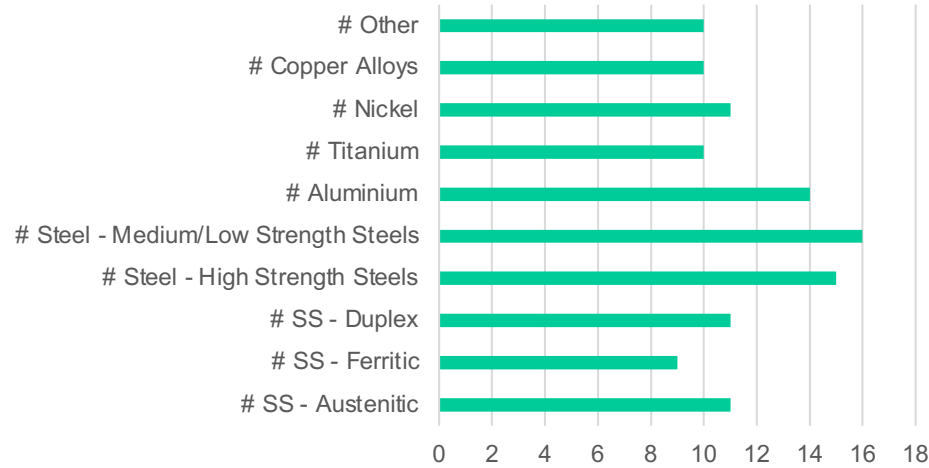
## Avg Readiness Level by Method



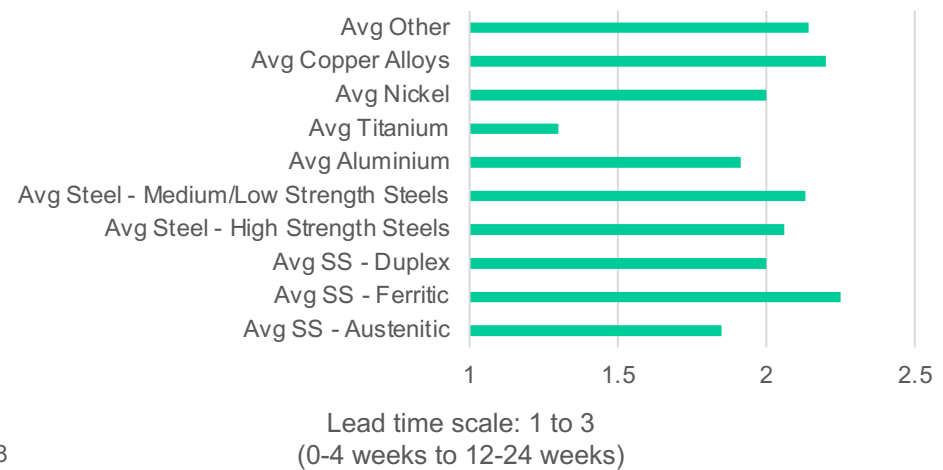
- Binder Jetting and Investment Casts are the highest TRL and MRL but also less common; some specialisation seen
- LPBD/DMLS has both second highest TRL and MRL while also being most common capability
- Variance within TRL/MRL suggests companies are still ramping up capabilities
- Spread in TRL/MRL shows capacity to produce parts now yet ongoing innovation on new capabilities in the future.

# Response Analysis (Material)

## No. of capacities using this metal



## Average Lead Time per Material

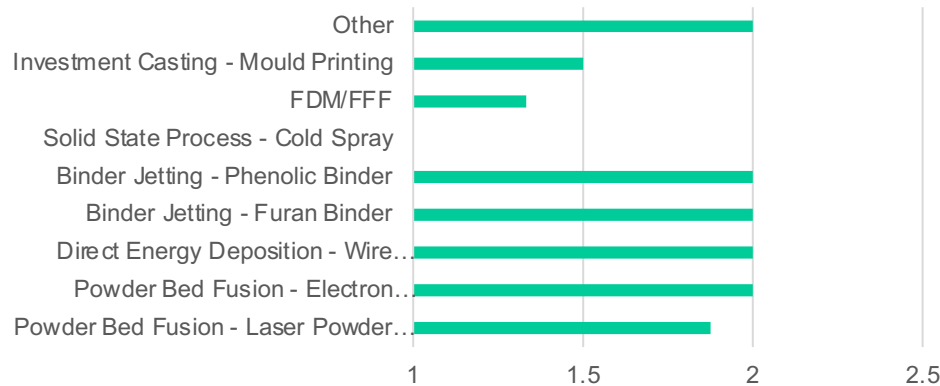


- Capacity No.  $\neq$  Company No., This is measure of prevalence of material across processes
- All materials were available by 9 or more capacities; materials are broadly available across companies and techniques

- High variance between companies lead time suggesting material availability is less important than company specific factors
- Lead times of 0-4 weeks are very much possible; mostly part dependent

# Response Analysis (Criticality)

Avg Max Criticality by Process



Criticality Scale: 1 to 3  
(Fail Safe to Fail Deadly)

**Part Criticality** is a measure of the importance of a part and consequence of part failure.

For a car this may be:

3: Wheel, Chassis or Windscreen (Fail deadly – Large Impact)

2: Wheel bearing, CV Joint (Fail Safe – Medium Impact)

1: Paint, Wing Mirror, Radio (Fail Safe - Low Impact)

- High variance between company's part criticality rating suggesting a range of confidence across industry
- Cold Spray was rated as only Fail Safe by both providers
- FDM/FFF was never rated above a 2

# Concluding Remarks

- There is a need for a regularly maintained/updated database of UK AdM capability that will enable the growth and networking of the sector.
  - Defence will benefit from this (e.g. Increasing availability / DT knowledge)
  - We still need more input data to form credible conclusions on capability gaps
  - Information needs to be updated regularly (requires a sponsor) & be made freely available (needs open source host)
  - Team Defence Information have applied resource to build on this initial work but cannot maintain into future
- 
- **If you want to get yourself on the UK AdM Capability Map, have specific capability requirements you would like to see mapped, or have thoughts on a candidate host for the AdM Capability Map – download via QR code.**



AdM Capability Survey

# Thank You

Stu Olden – [stu.olden@teamdefence.info](mailto:stu.olden@teamdefence.info)



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# Kaizen PLM & Siemens

Anthony Riordan and Olivier Diegerik

10:15 – 11:15





# Industrializing Additive Design and Manufacture for Aerospace and Defense

Delivering end-to-end additive manufacturing solutions for MoD, Aerospace OEMs and Suppliers

Anthony O'Riordan (Kaizen PLM, Siemens AM Smart Partner UK&I)

Joseph Clulow (Siemens Digital Industries Software)

Kevin Holland (Kaizen PLM, Siemens AM Smart Partner UK&I)

Olivier Diegerick (Siemens Digital Industries Software)



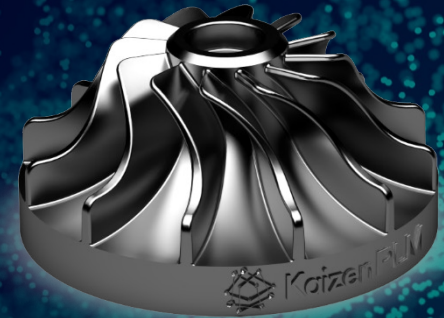
Expert  
Partner

Digital Industries Software

SIEMENS

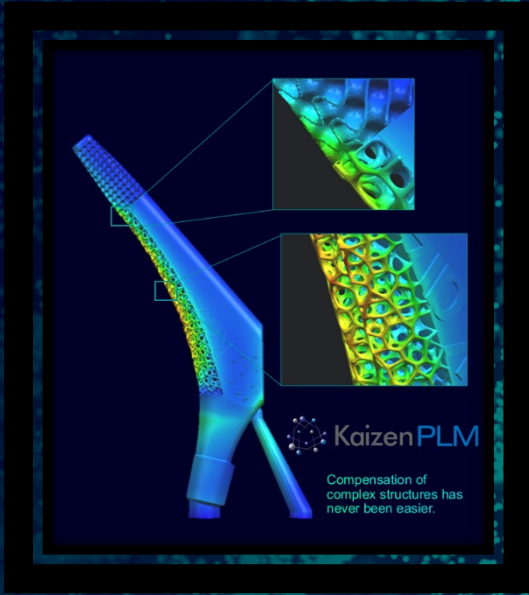
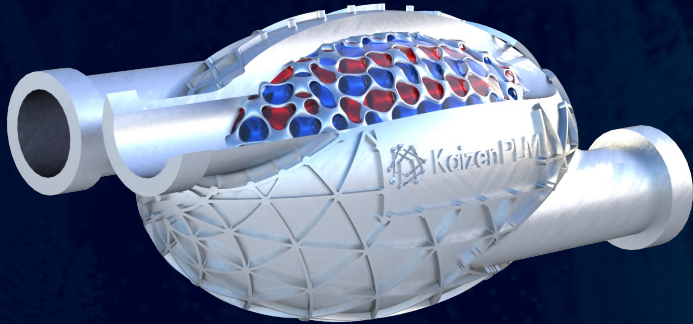
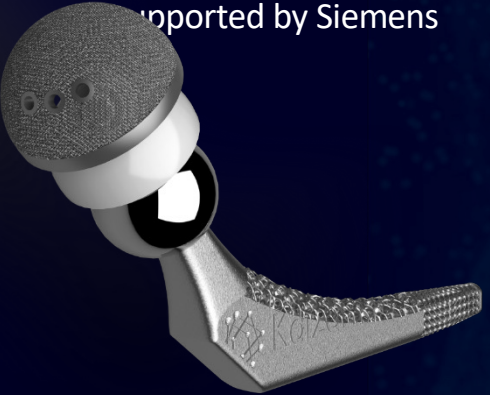
# Who we are

- Kaizen PLM are a Siemens Industry Software gold partner for Ireland and the UK
- Kaizen PLM were the first accredited Siemens Additive manufacturing Smart Partner Globally and the designated AM smart expert for the UK & Ireland.
- We specialise in CAD, CAM, CAE, PLM and Industrial IoT software solutions.
- We are also uniquely positioned to provide Siemens virtual commissioning solutions, due to our in-house engineering team working closely with our partners at Underwoods, utilising their Tia Portal and Simit Expertise to deliver end to end virtual commissioning solutions.
- The team at Kaizen PLM consist of experienced mechanical, precision, electrical and PLM engineers and use our skills to support the deployment of software for mechanical and electrical design, manufacturing planning and simulation, component and system level physics simulation, virtual commissioning and product lifecycle management.



# How we help.

- In-depth consultation to assess your processes and identify improvement opportunities via our engineering consultancy team.
- Provide tailored software solutions to meet your objectives.
- Provide ongoing training and support to maximize software and user capabilities.
- Design, CAM programming, 3D simulation, post processor development and workflow optimisation services ad-hoc.
- Implementation and integration support for all our solutions which are fully supported by Siemens



# Trusted partner for the future of Aerospace & Defense



L3HARRIS

GENERAL DYNAMICS

NORTHROP GRUMMAN

LOCKHEED MARTIN



BOEING

BAE SYSTEMS

BOMBARDIER

PILATUS



BYE AEROSPACE



U.S. AIR FORCE

AIRBUS

Honeywell



Raytheon  
Technologies



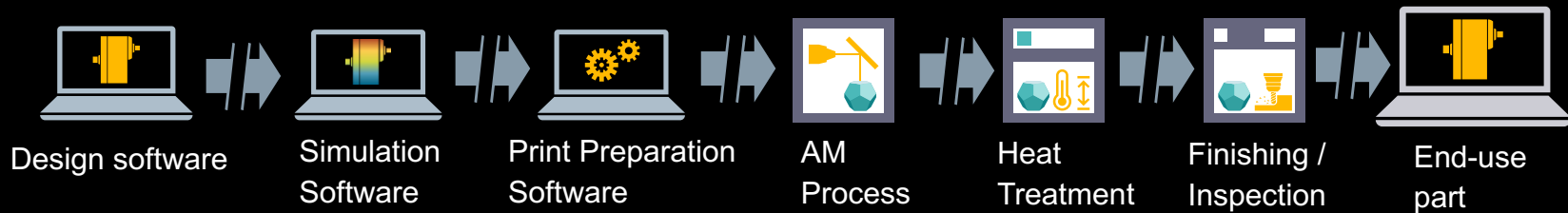
arianespace  
arianegroup



# The Problem...

The UK Ministry of Defence (MoD) is equipped with state-of-the-art additive manufacturing (AM) equipment to facilitate rapid part repair in battlefield scenarios. However, critical obstacles hamper their operational efficiency:

1. The absence of 3D CAD Models
2. The MoD lacks essential software tools for rapid design and reverse engineering when you do have a physical part available
3. Lack of a centralized digital inventory
4. Disparate and Disconnected Systems

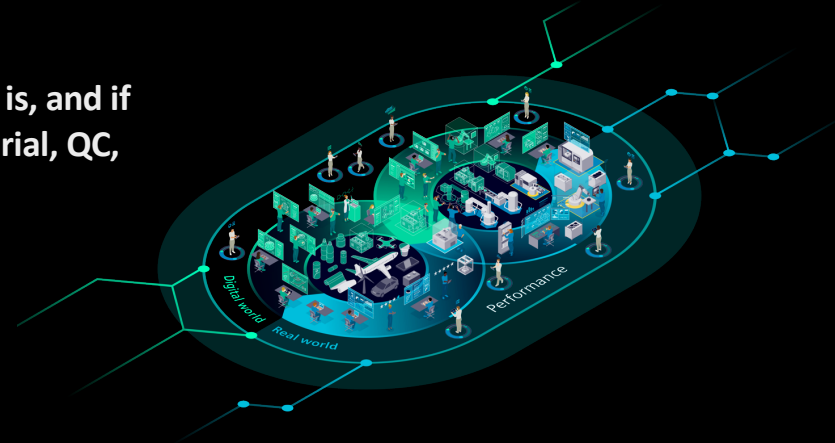


# The Solution...



A modern software application operating in a NATO level secure cloud environment

1. A robust suite of industry proven tools tailored to the unique needs of the defense sector.
2. Rapid reverse engineering of point cloud data from 3D scanners.
3. A secure, cloud-hosted part repository, equipped with automated workflows for streamlined operations.
4. A solution which tells you what equipment is available, where it is, and if that equipment is suitable for the requirements of your part (Material, QC, NDT, V&V ETC.)



## Content Overview

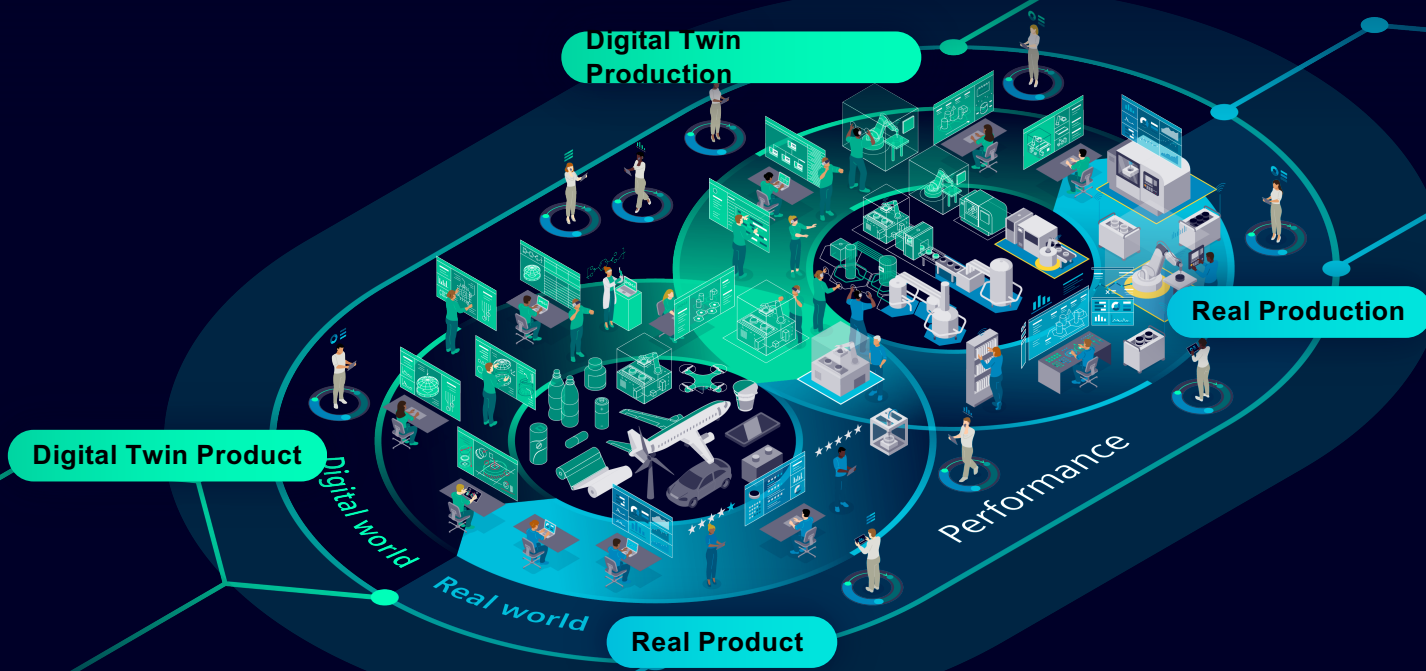


- Introduction to Siemens Xcelerator
- Digital Threads for Additive
  - Additive Manufacturing Network
  - Teamcenter Management and Data Security
- Modelling and Manufacturing Capabilities
- AM Hackathon
- Success Stories



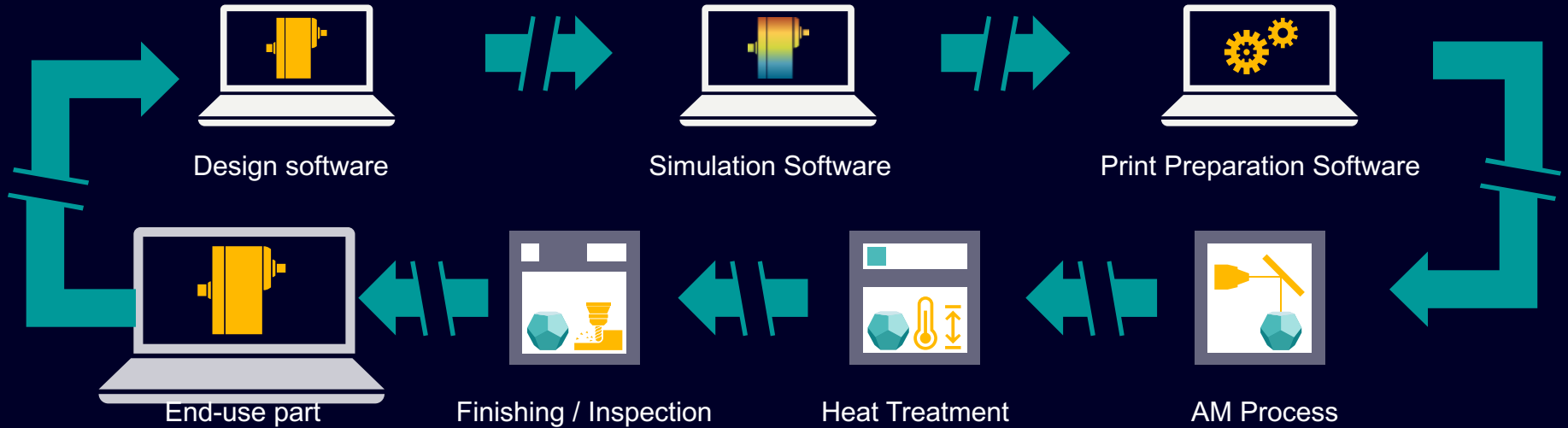
# Siemens Digital Enterprise

## The comprehensive digital twin approach





# Barriers to industrializing additive manufacturing



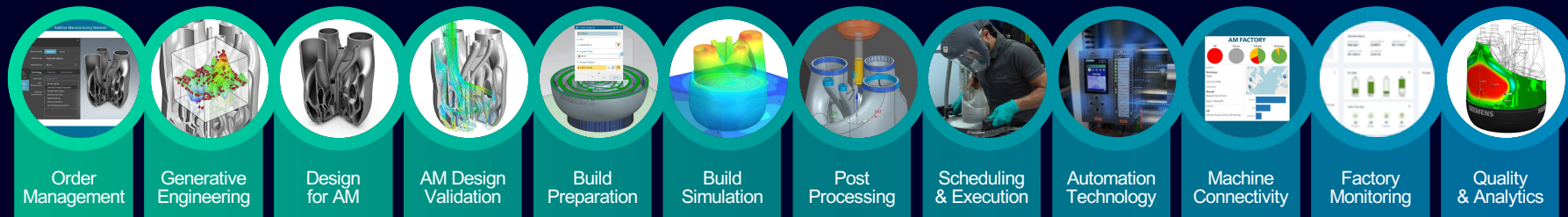
**Conventional thinking**

**Disconnected process chain**

**Multiple file conversions**

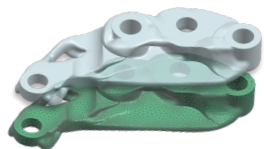
**Uncontrolled workflow**

# Siemens' end-to-end solution offers key differentiators that help industrialize AM

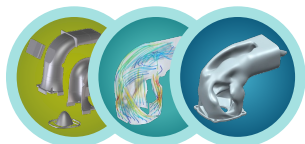


## Five Key Differentiators

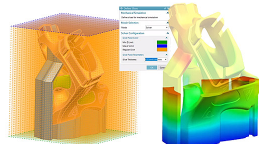
Unified solution for additive idea-to-part



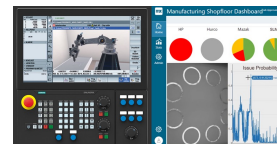
Multi-disciplinary generative engineering



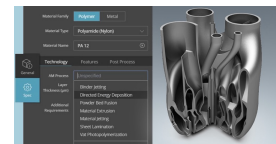
Simulation-driven first-time-right 3D printing



AM machine automation, control and connectivity



Managed environment from order-to-service

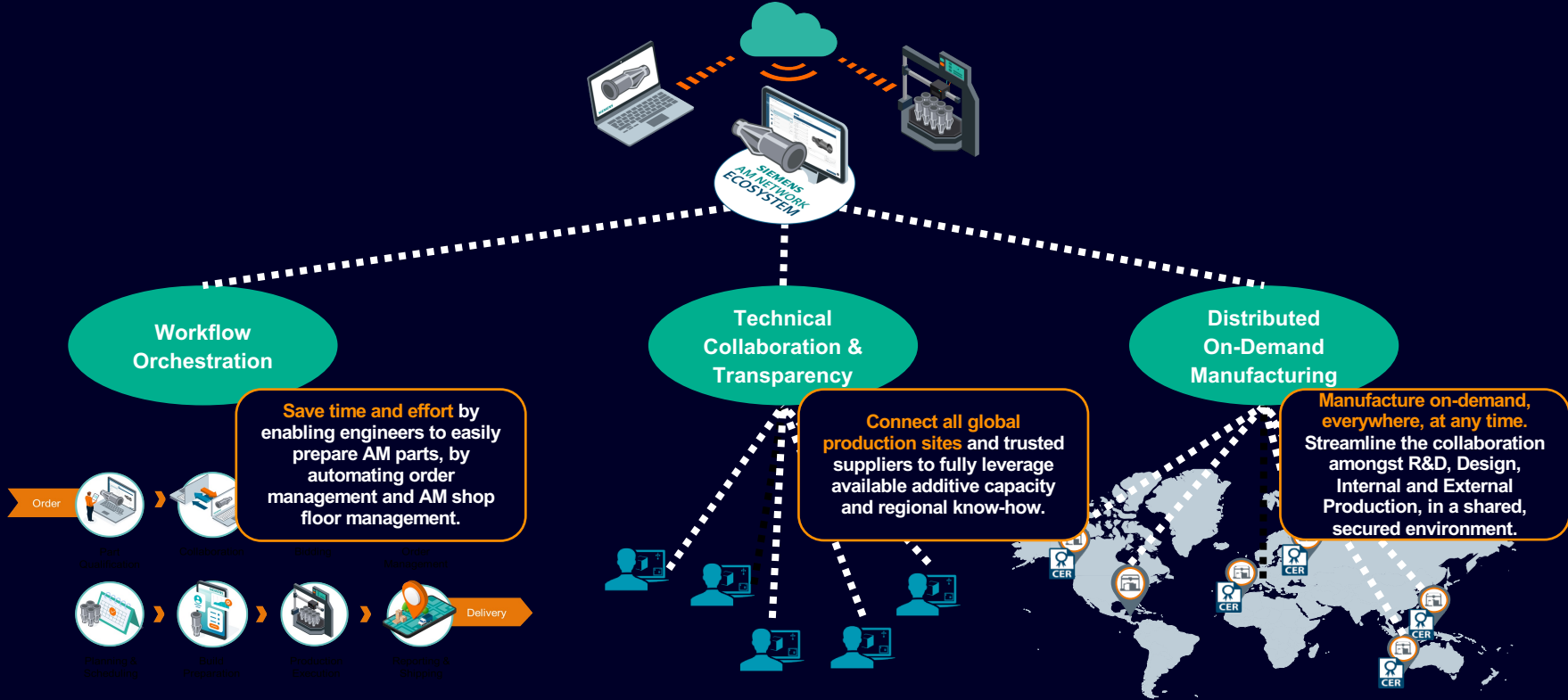


# Siemens end-to-end AM solution



# Siemens' AM Network for Enterprise Customers

## 3 Key Value Drivers



# End-to-End Digital Thread for Additive Manufacturing Driven by Order Lifecycle & Production Management



## Requestor Journey

## Fulfillment Orchestration

## Execution & Monitoring

## Settlement & Dashboarding



Order Creation



Planning & Scheduling



Build Preparation



Production Preparation



Execution & Monitoring



Quality Management



Shipping & Analytics

Evaluate cost, time and submit orders

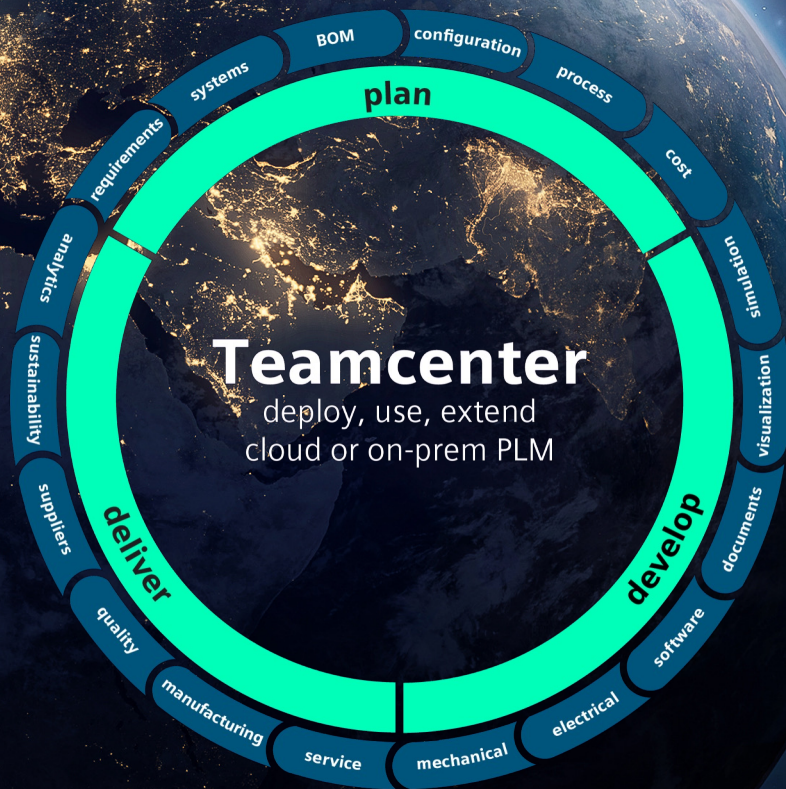
Detail plans and assign to the appropriate sites

Monitor order progress, trace production steps, record quality events

Analyze business performance



# Data Security through the AM workflow



## Leading choice in PLM

#1

Preferred by customers, validated  
by experts, chosen by industries

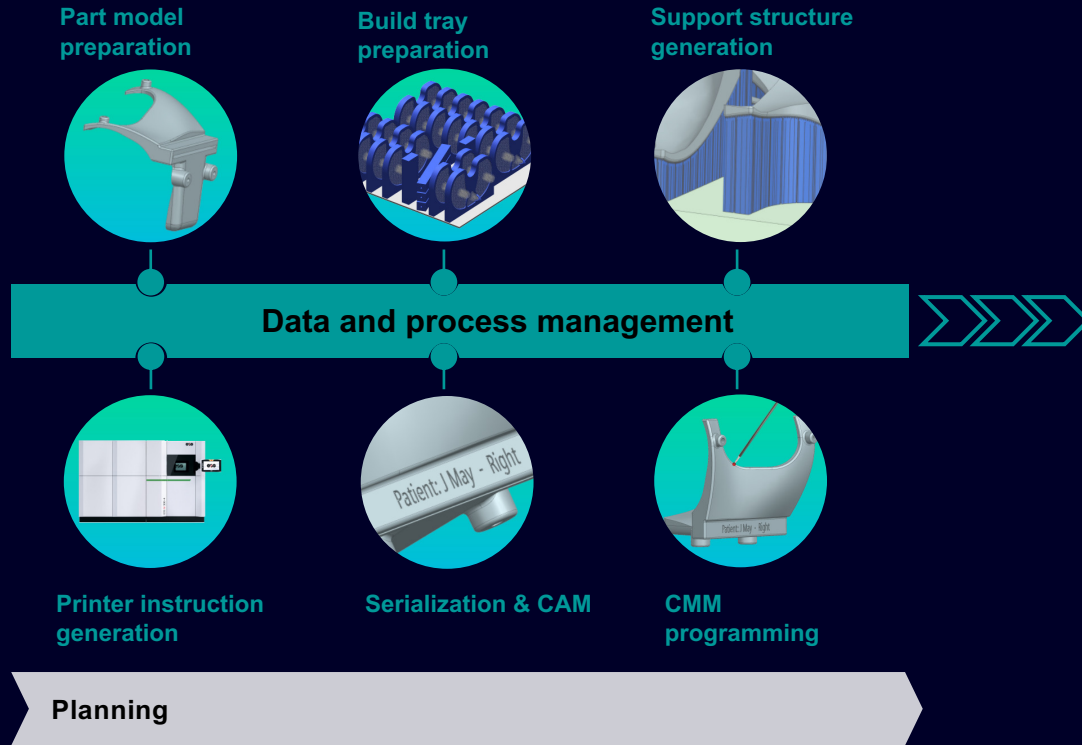
### Powering innovation

Making more of the products you  
use every day possible

### Leading-edge

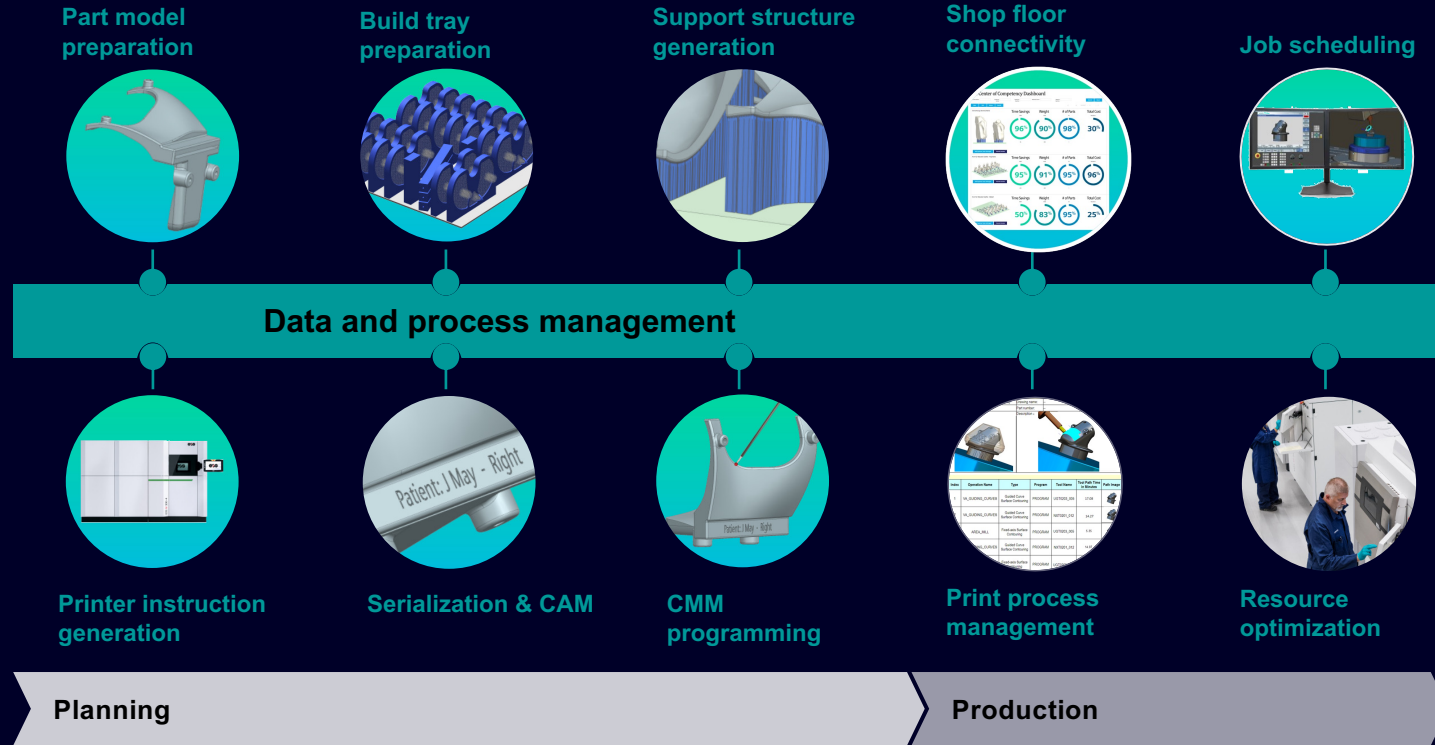
Delivering the future of PLM,  
today

# Connecting manufacturing using a single source of data



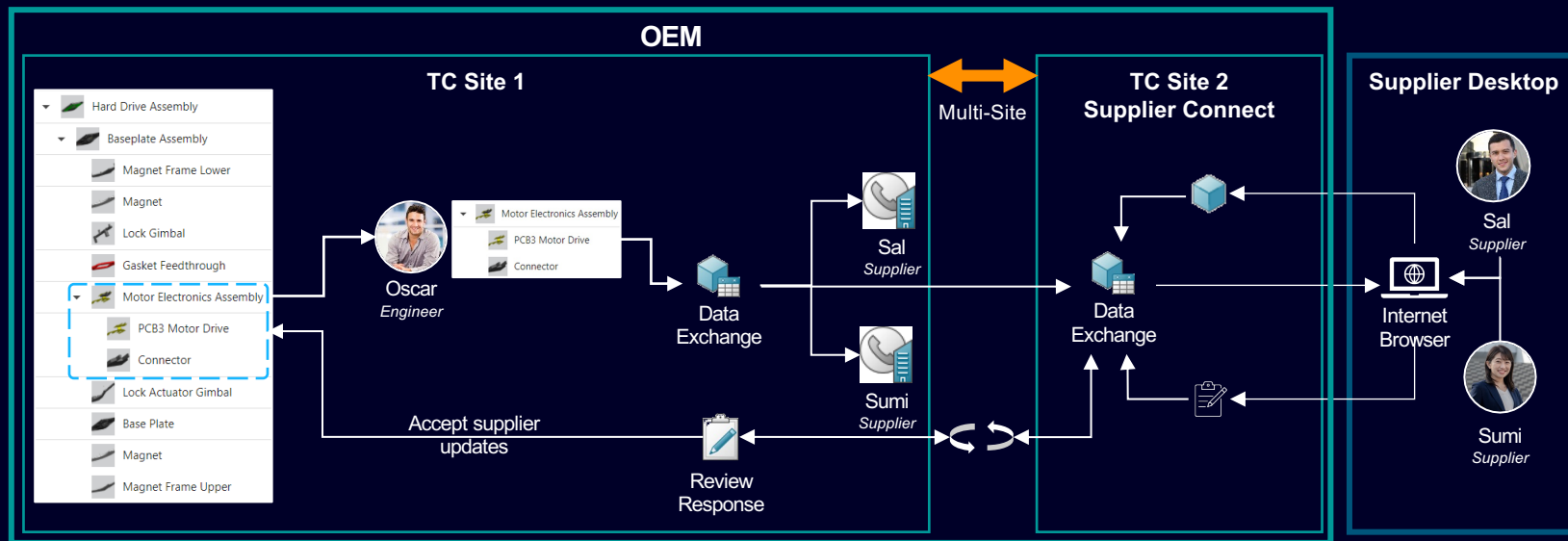


# Connecting manufacturing using a single source of data

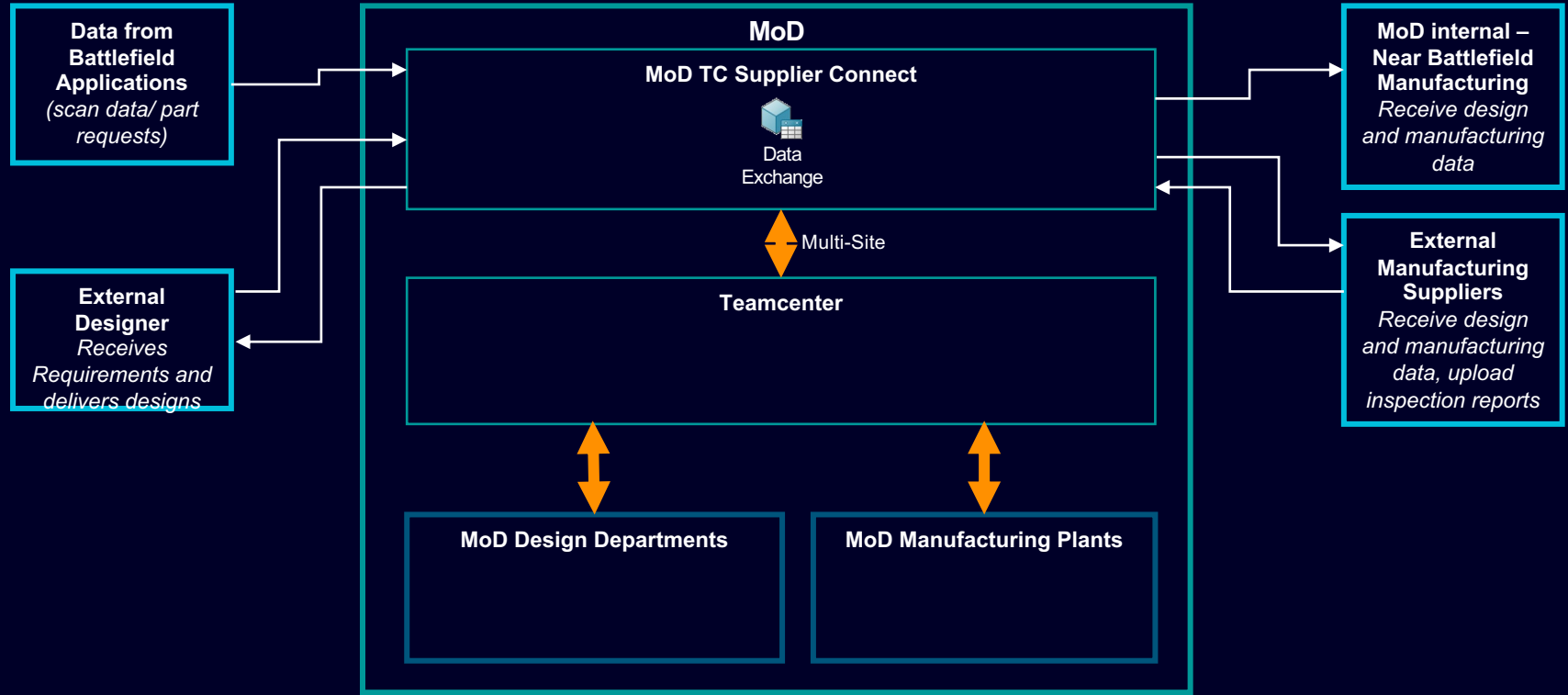


# Supplier Connect

Collaborate on any product data in a secure and web-based environment

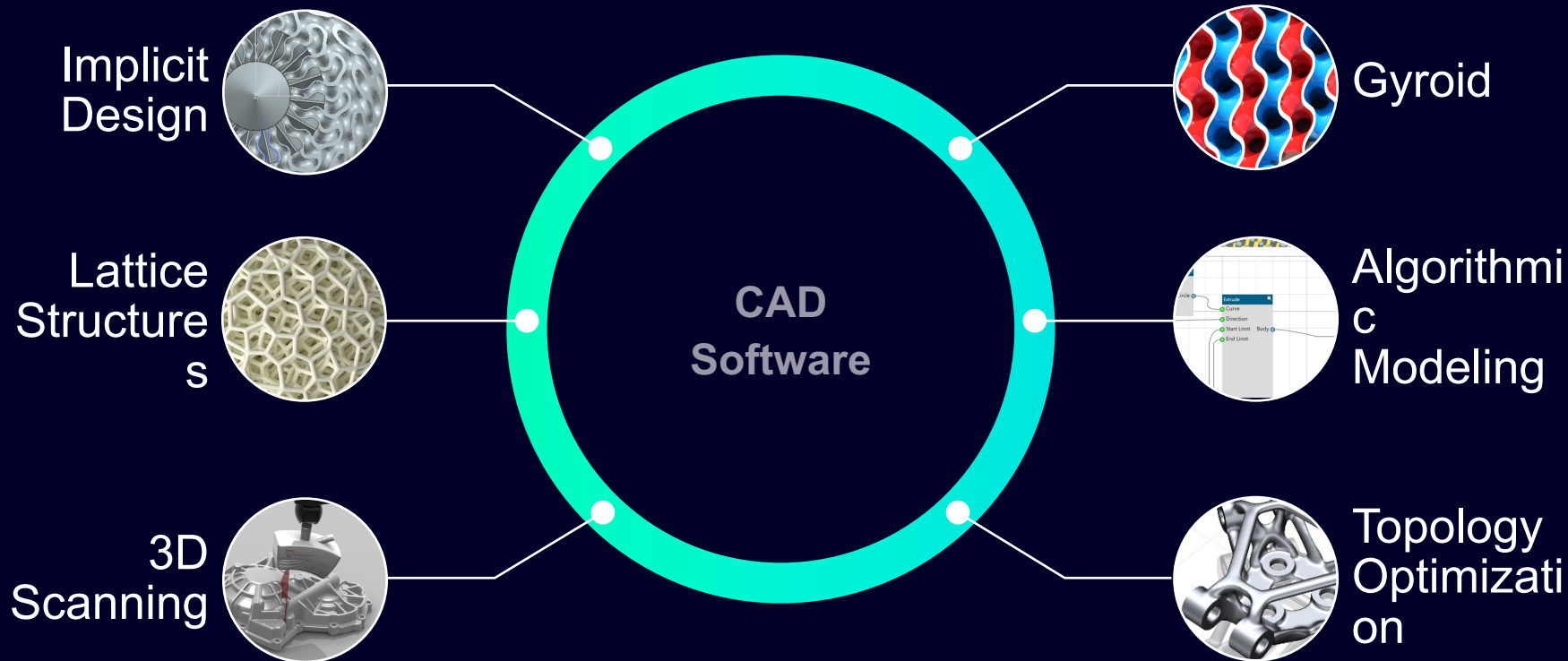


# Possible Data Management and Transfer Structure

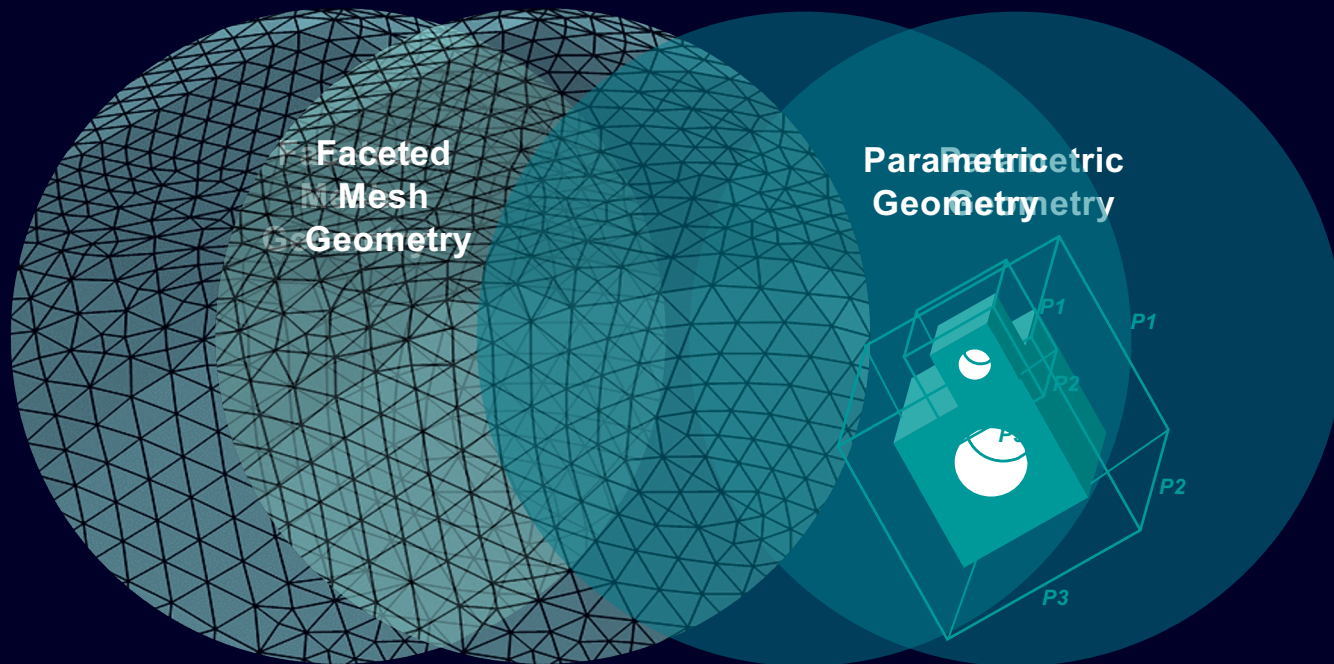


# Design for Additive Manufacturing

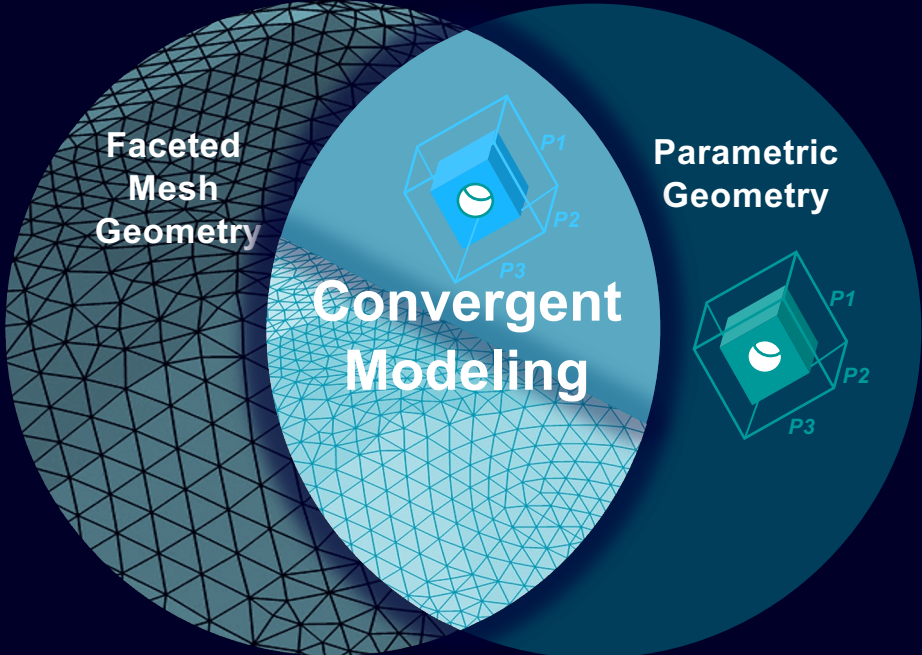
A more and more complex landscape



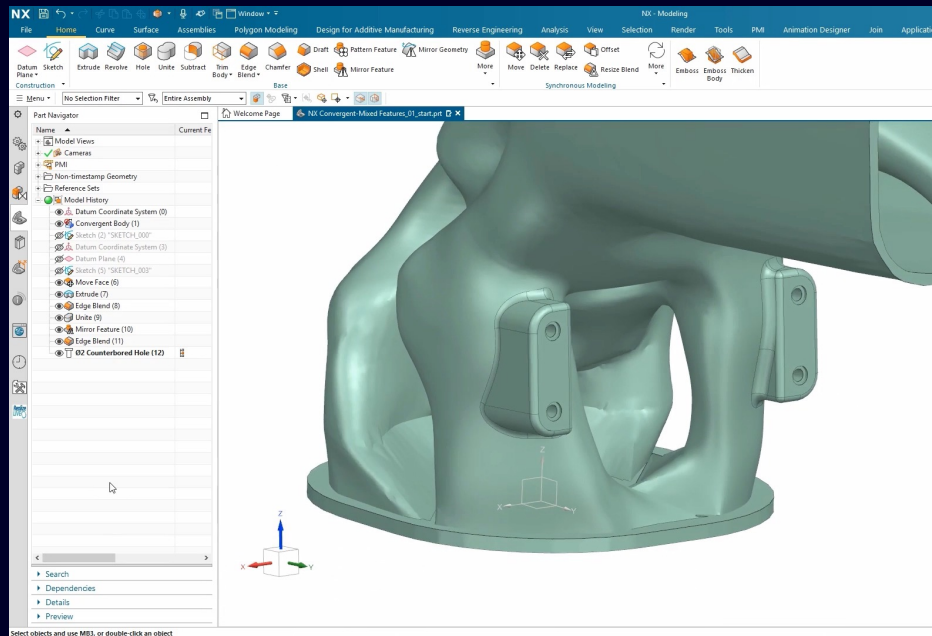
# NX Convergent combines mixed geometric formats for speed and innovation



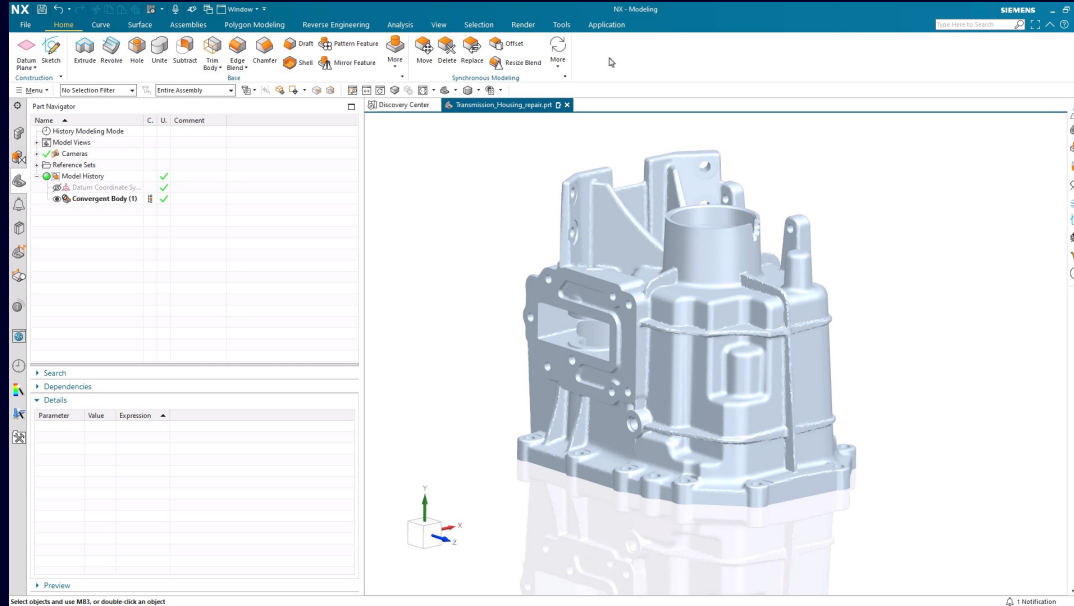
# NX Convergent combines mixed geometric formats for speed and innovation



# NX Convergent combines mixed geometric formats for speed and innovation



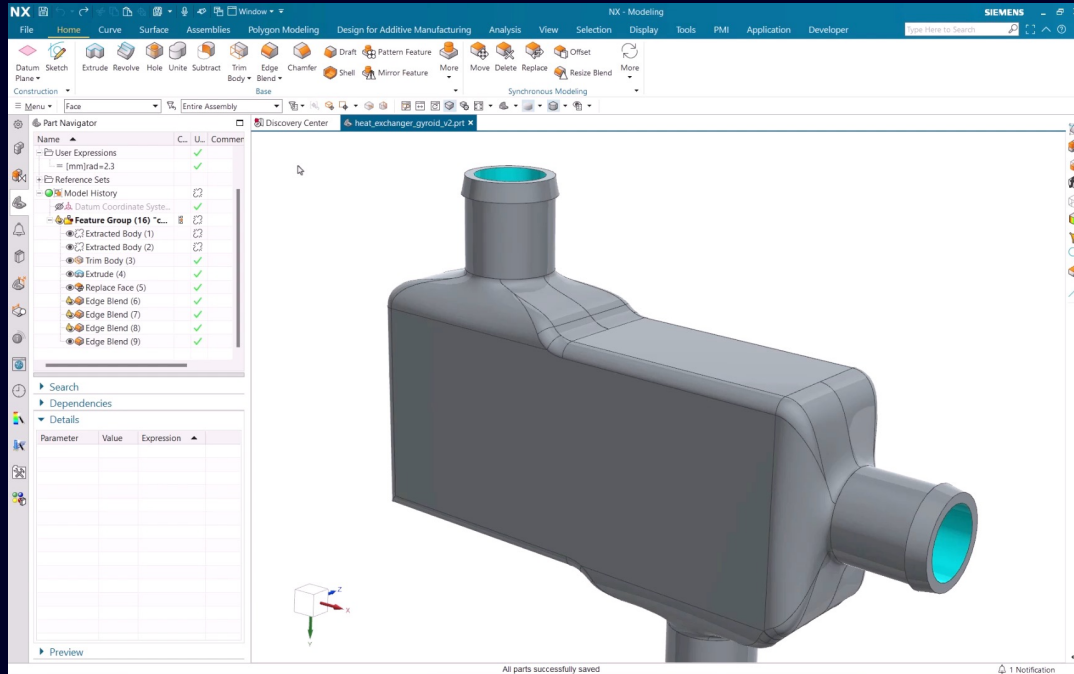
Modeling environment that enables designers to directly manipulate facet bodies and combine facet and B-rep geometry



Fast, flexible CAD tools to accurately capture (scan) designs, manipulate that data, and quickly reconstruct as needed to leverage in downstream engineering workflows.

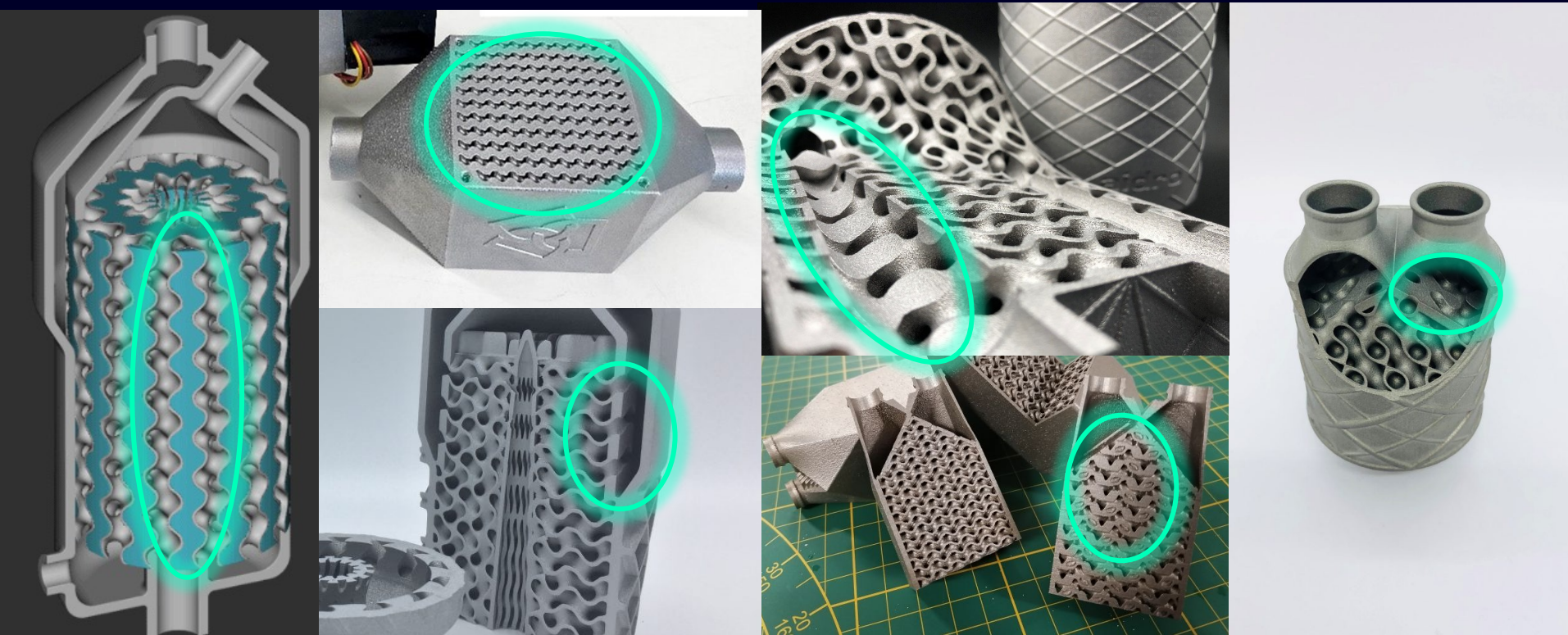


# Implicit Modeling



Creation of equation driven structures and performing robust modeling operations on complex designs

# Implicit Modeling

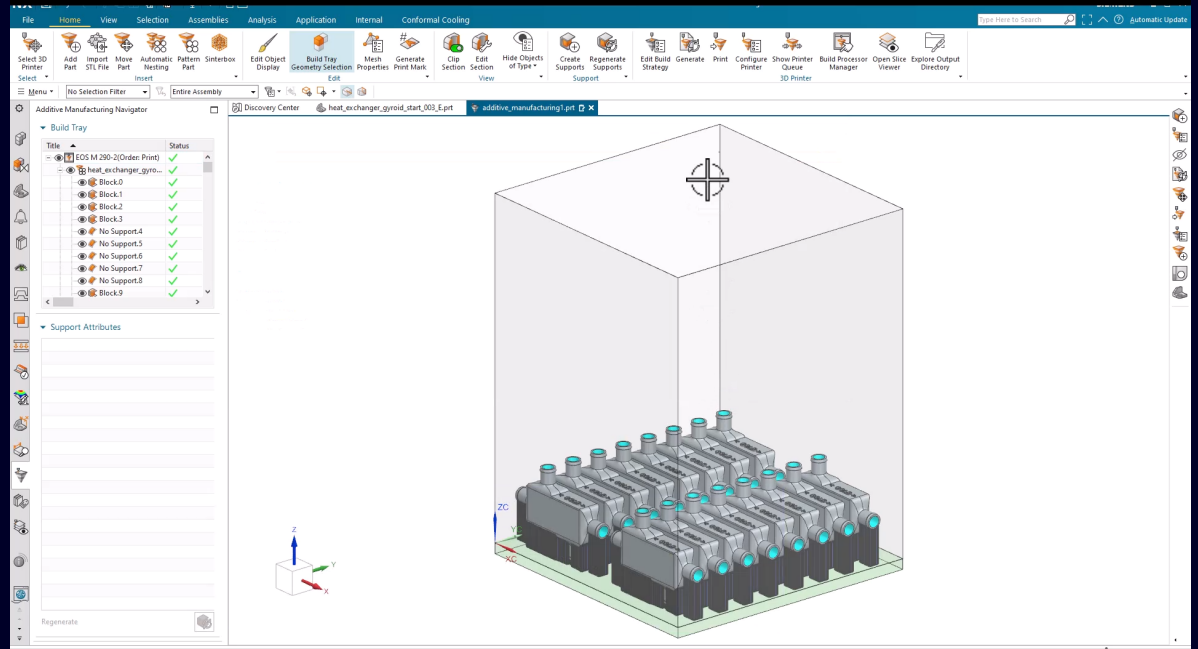
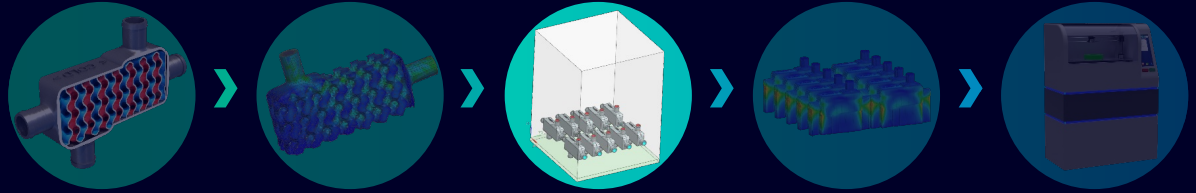


## PREPARE FOR PRINTING

Orient part in build tray through optimization or manually

Design support structures

Validate printability

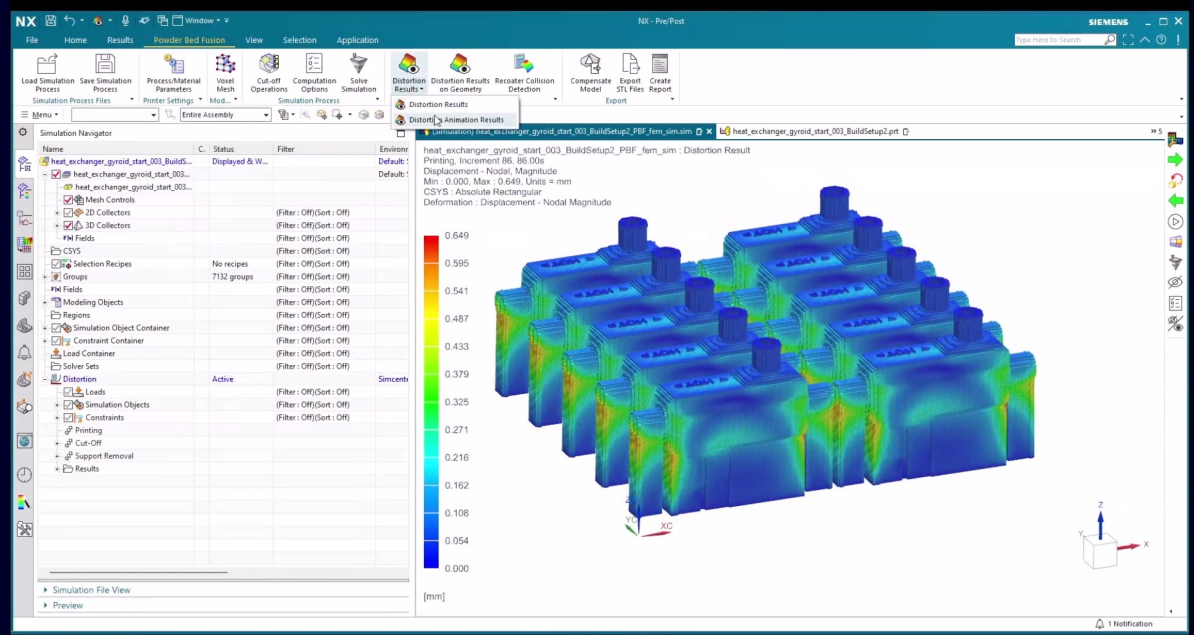
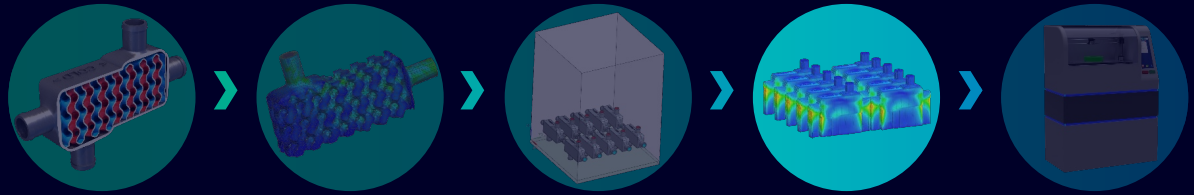


## SIMULATE PRINT PROCESS

Simulate the print process to reduce waste and ensure print quality

- Identify areas of concern such as areas of high stress or distortion
- Generate compensated geometry to alleviate distortions during printing

Generate more “First time right” prints by simulating the build process before printing

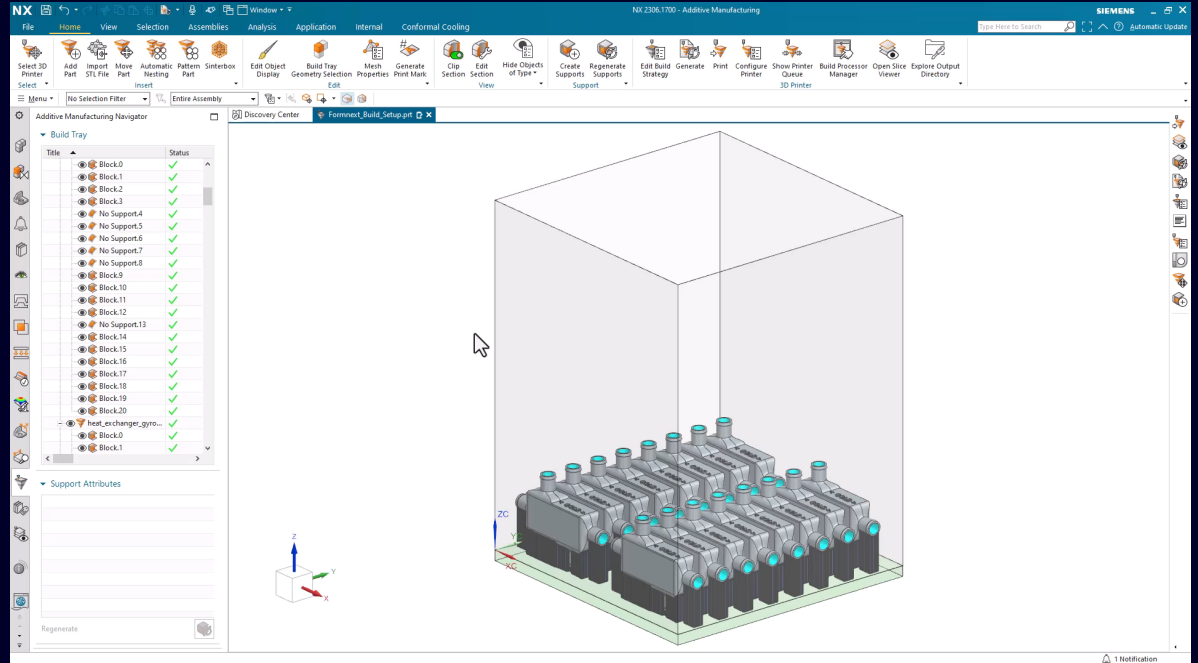
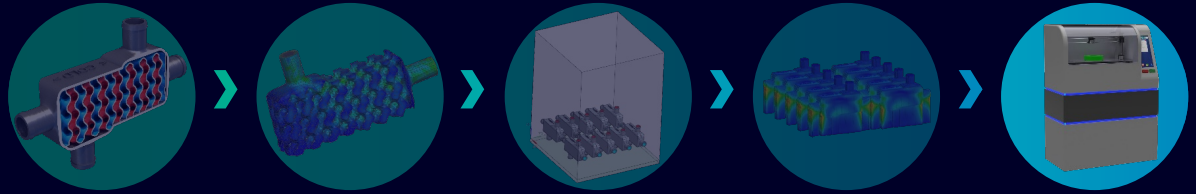


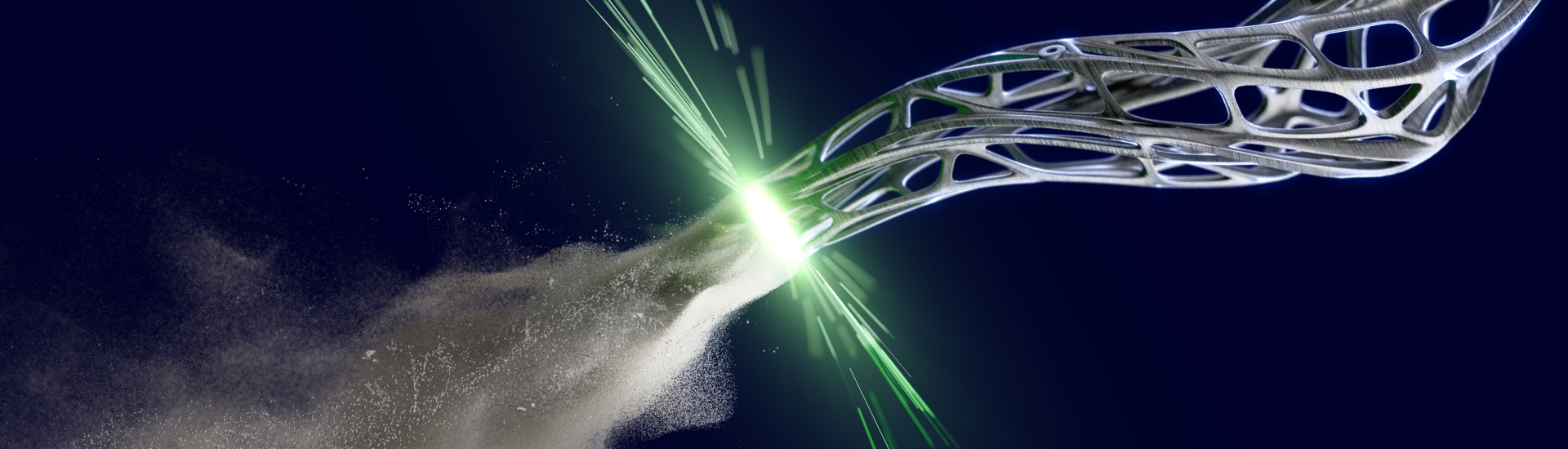
## 3D PRINT FINAL GEOMETRY

Directly drive a multitude of printers from major vendors

- Planar & multi-axis
- Hybrid printers
- EOS
- Renishaw
- DMG Mori
- BEAM
- Trumpf

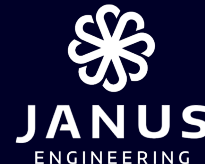
Utilize the advantage of additive manufacturing to manufacture complex internal structures for thermal exchange





# Let's advance manufacturing – **Multi-axis AM technologies**

Adaptive blade repair



**Let's advance  
manufacturing!**

# Additive Manufacturing Operations Management

## Opcenter APS, Execution & Intelligence

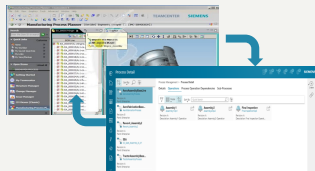


### Key differentiators

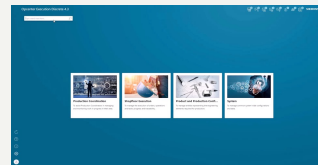
Out The Box Intelligent Scheduling Algorithms



Additive, Discrete and Complex Manufacturing



Essential Powder Quality & Cost controls



Data integration, data analytics and reporting for EMI

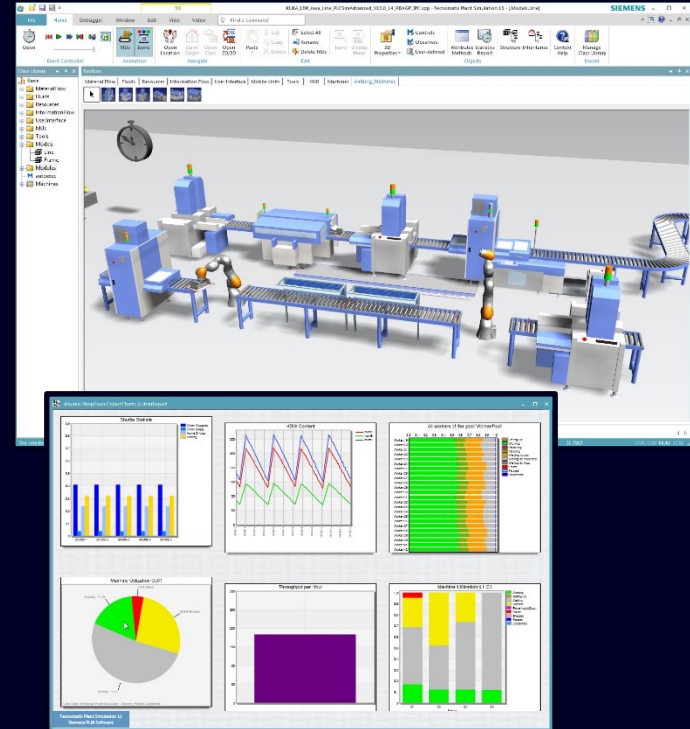




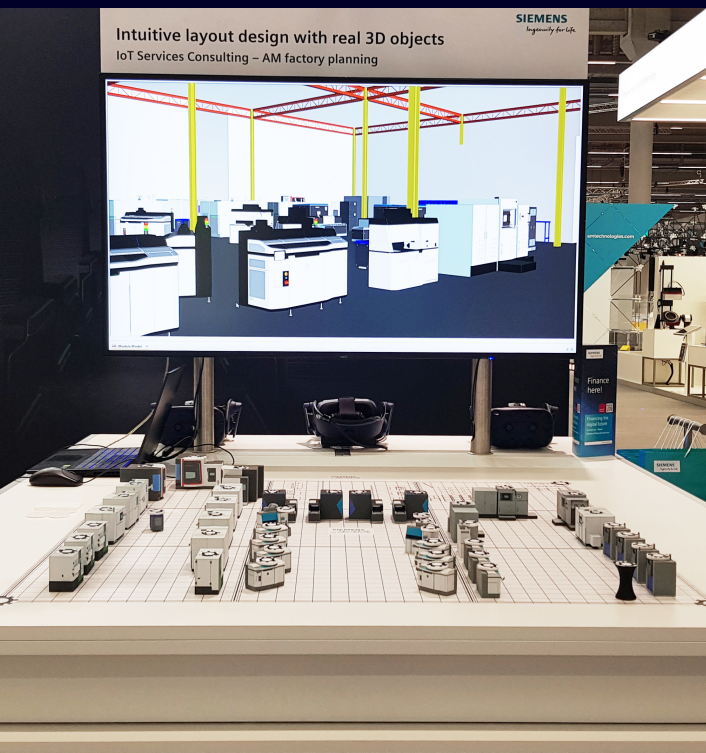
# Plant Simulation

Tecnomatix Plant Simulation helps to:

- Detect and eliminate problems that otherwise would have required costly and time-consuming correction measures during production ramp-up
- Minimize the investment cost for production lines without jeopardizing the required output
- Optimizing the performance of existing production systems by implementing measures that have been verified in a simulation study, prior to implementation in the real system.



## Intuitive layout design with real 3D objects



Simulate the complexity of a real production based on intuitively build production layouts.  
 Visualize, analyze and optimize the influence of layout changes to your production output.





**1**  
**Event**

**10**  
**Teams**

**12+**  
**Items**

**28**  
**Hours**

**1**  
**Goal**



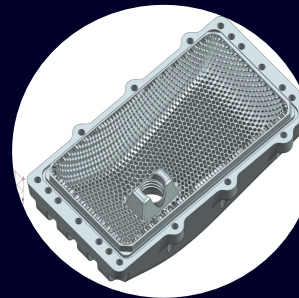
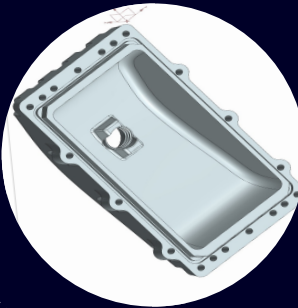
# Suspension Sump Challenge

Design tools to re-model

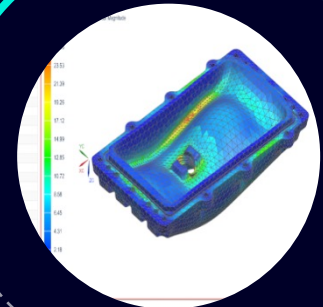
Simulated for shape optimisation



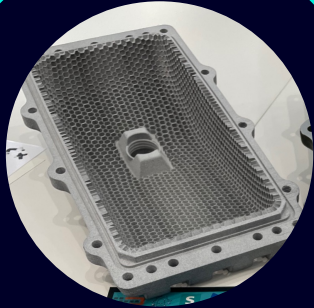
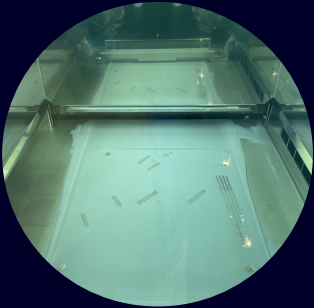
Received and Imported Scanned Data 11.30am



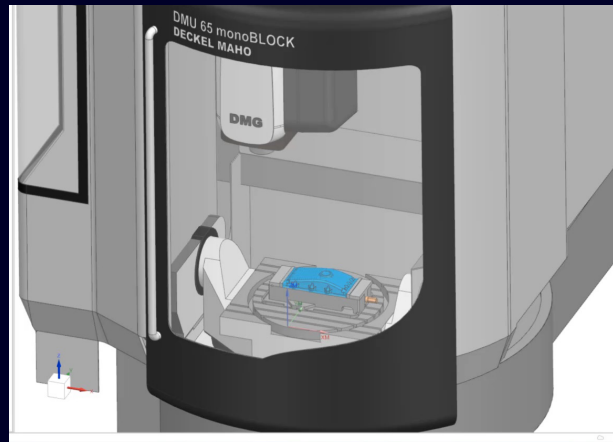
Lattice Feature Included



Final part 1:1 scale



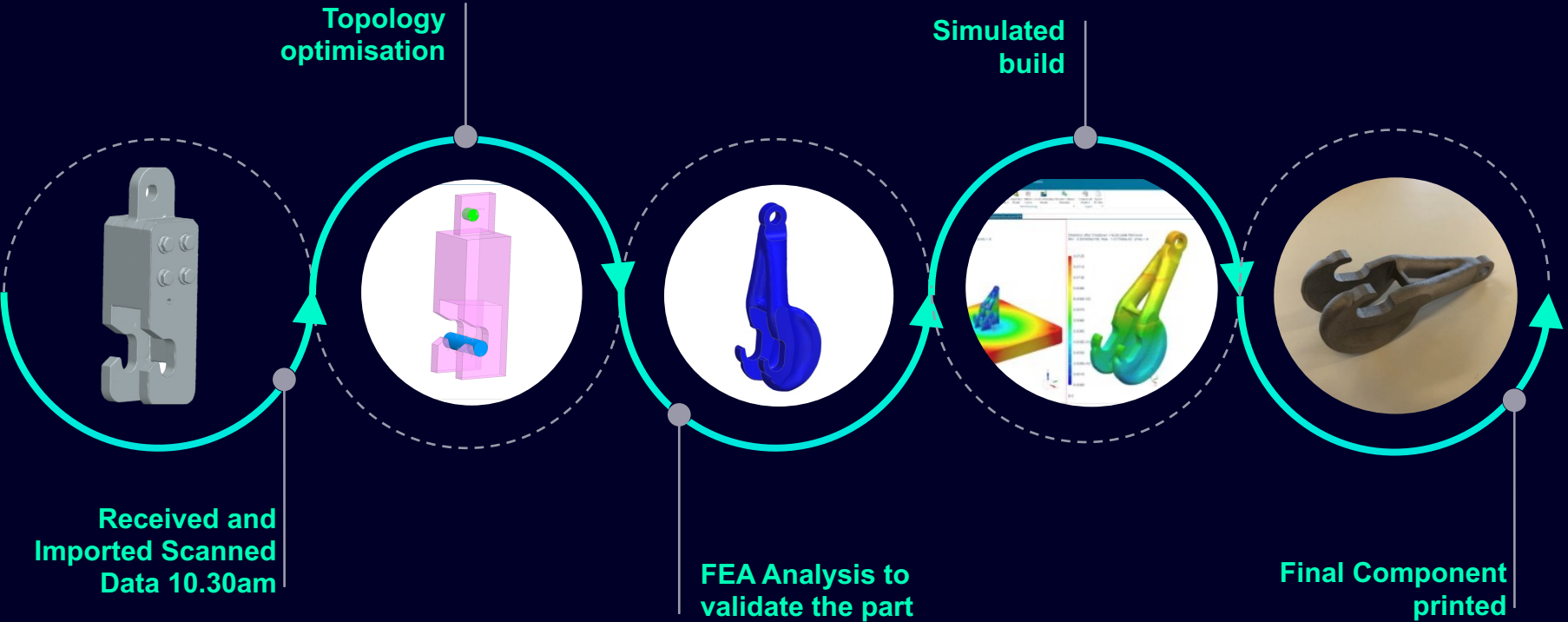
Sent to print by 3pm same day



- Received, scanned, optimised part ready for print within 3.5 hours.
- 15% weight reduction
- Printed in 1:1 scale
- Full traceability in a secure environment
- Presented post-processing techniques



# Lifting Hook Challenge



A glowing blue particle stream, resembling a spray or a stream of light, forms a circular shape against a dark background. The particles are concentrated in the center of the circle, creating a bright, glowing effect. The overall image has a futuristic, digital feel.

# Current successes for AM in A&D

# U.S. Air Force



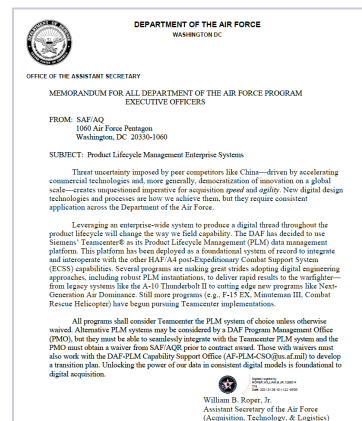
## Challenge

Increasing competitor innovation, speed and agility are required to remain the leader

## Solution

Teamcenter

Enterprise-wide system used to create a digital thread through the lifecycle





Tc is the standard for the USAF  
 A Small business, K2, won an award to set up TC as the DT4AM for USAF  
 (AGORA)

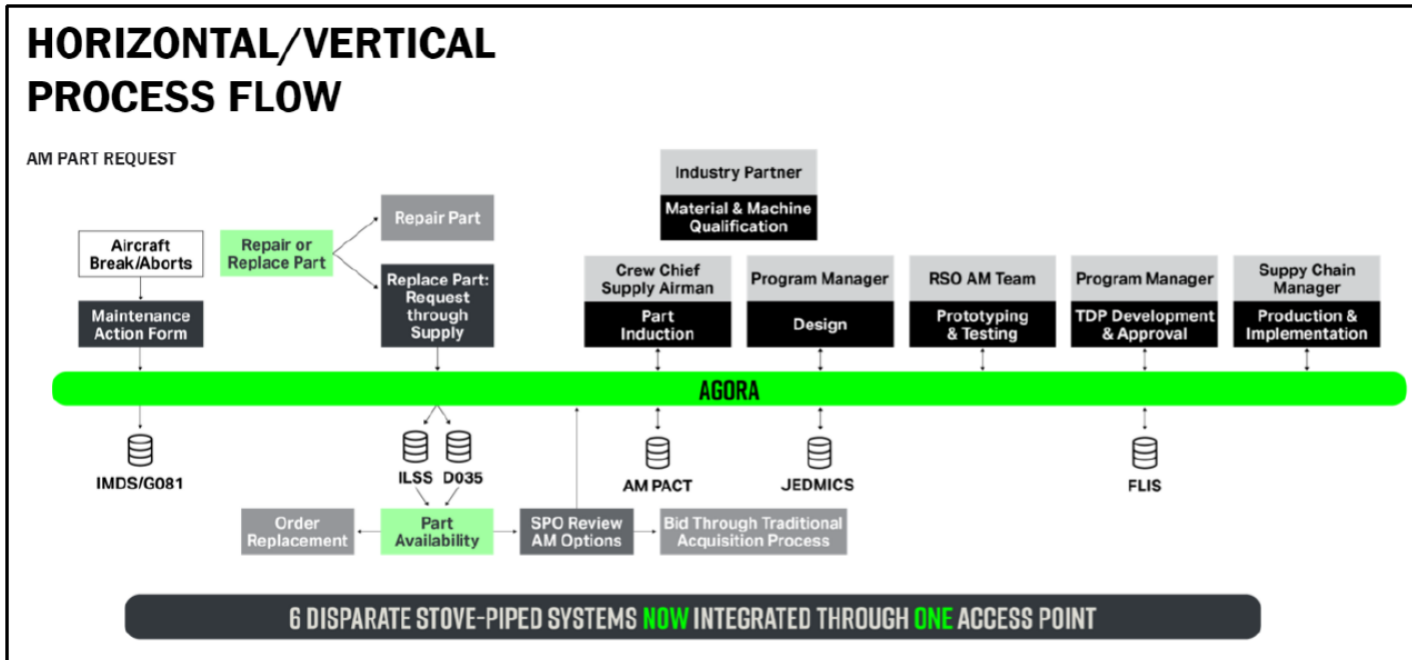
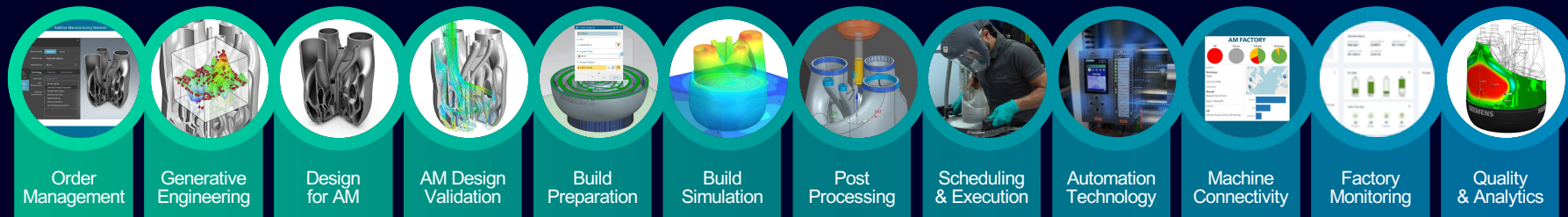


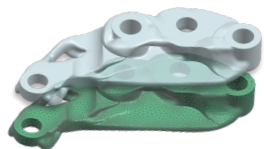
Figure 1 AGORA High Level Process Flow

# Siemens' end-to-end solution offers key differentiators that help industrialize AM

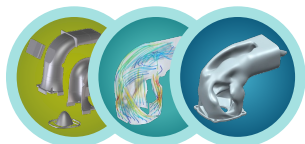


## Five Key Differentiators

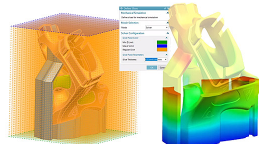
Unified solution for additive idea-to-part



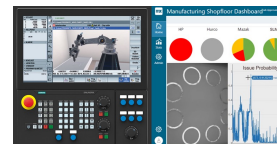
Multi-disciplinary generative engineering



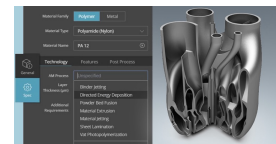
Simulation-driven first-time-right 3D printing



AM machine automation, control and connectivity



Managed environment from order-to-service



# Making aerospace AM valuable for pragmatists

Facilitating aerospace production with integrated end-to-end solutions.



Capitalizing on trends in aerospace and solving key problems.



Making it easy for aerospace companies to scale AM.





Strategic Command  
Defence Support

Pulse survey ->



Coffee Break  
11:15 – 11:45



Strategic Command  
Defence Support

# Overview of successful proposals for Spiral 2

Richard Hamber

11:45 – 12:00

# Project TAMPA 'Chief of Defence Logistics and Support (CDLS) Additive Manufacturing as a service Challenge'

## Spiral 2

### AdMaaSWG Update

19 Mar 2024

# REQUIREMENT (1)

The focus remains on metallic parts, but the Authority now seeks bids for parts that display one or more of the following criteria:

- It/They must be metallic in nature and different to those being supplied under Spiral 1 (for those Framework Contractors already engaged on Spiral 1).
- It/They can be either non-safety critical or safety critical
- It/They can be fitted to a Fixed Wing (FW) or Rotary Wing (RW) platform or a FW or RW Ground Support Equipment
- It/They can be fitted to platform that has been Granted in Kind (GiK) to Ukraine, or is operating in Ukraine (provided these are covered by an existing MOD Support Contract).
- It/ They achieve acceptance into service and/ or will be fitted to an in-service platform within the period of this task (out to Mar 25)
- It is a/They are part(s) for which there is a shortfall and for which the vendor has gained agreement from the DE&S DT that they require these parts and will support the process through to onboarding/ fitment onto an in-service platform.

# REQUIREMENT (2)

## OPTIONAL WORK PACKAGES

Over and above the fully compliant bid for the full Spiral 2 requirement, Tenderers should include in their bids a number of additional Optional Work Packages, quoting for additional benefits that could be derived in respect of the Spiral 2 requirements if further funds were to become available.



Ser	Firm	NSN	Short Desc	Justification (Safety Critical , Obsolete, Ukraine, Air Domain)	Lead Time (LT) Current	LT Anticipated	Notes
1	Babcock (Core)	FL19978, FL19979 and FL19980	Pole Bar Shackle (Centre Socket) & Pole Bar Shackle (End)	Obsolete Safety Critical	NA	4 weeks	13lb Ceremonial Field Gun, steering & braking system. In service until 2030. Part consolidation from 4 to 2.
2	Babcock (Additional work package)	2540-99-9585252	105mm L118 Light Gun Towing Eye.	Obsolete Ukraine	3 months	3 weeks	Additive Repair as alternative method for Spiral 1 part. On COSL 2 demands outstanding.
3	NP Aerospace (Core)	2510-99-671-5717 and 2510-99-671-5749	Side Bracket Assembly	Safety Critical	12 weeks	2 weeks	Also used on MASTIFF vehicles. Part consolidation.
4	RBSL (Core)	2590-99-555-2833, 2590- 99-234-6135, 2540-99- 535-4034	Bracket, Guard, Tow Rope Stowage Hook	Safety Critical Ukraine	Obsolete	4 weeks	Titan, T2 & CR2. In service until at least 2040. Part consolidation.
5	RBSL (Additional work package)	2590-99-510-9908, 5340- 99-979-3574	Bracket, Reservoir Bracket Welded Assembly	Safety Critical Obsolete	Obsolete	4 weeks	Titan In service until at least 2040.
6	Thales (Core)	5865-99-665-9620	118 Magazine Assembly	Air Domain Safety Critical	34 weeks	12 weeks	Fitted to Apache, Wildcat, & NHM. In service for 30 years. Part consolidation & weight reduction.

# Q and A



Strategic Command  
Defence Support

# Procedure for Stalls Part 1

Edit Barbantan

12:00 – 13:00



## Meaning of colours for the day

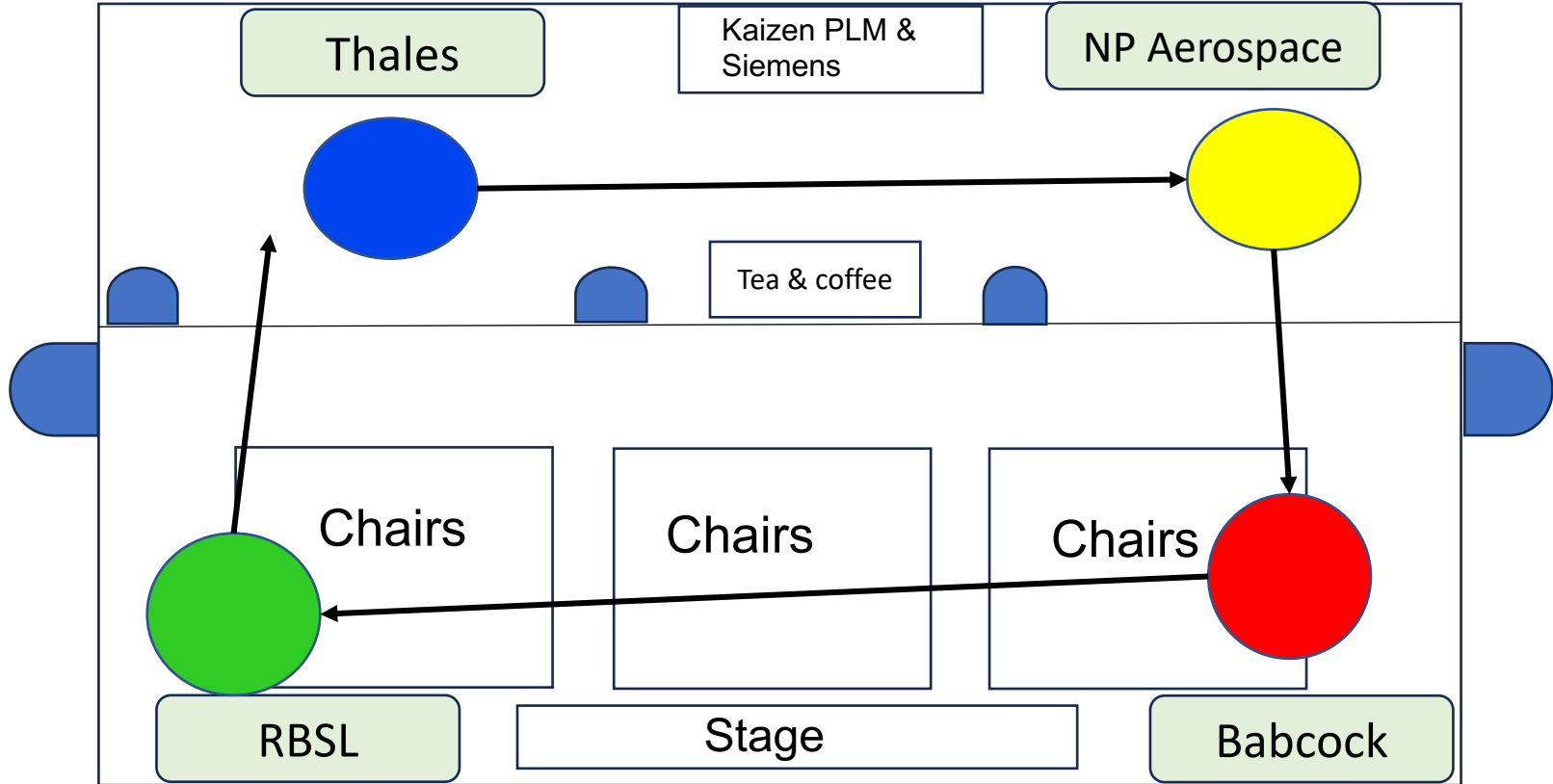
Green – group #1

Blue – group #2

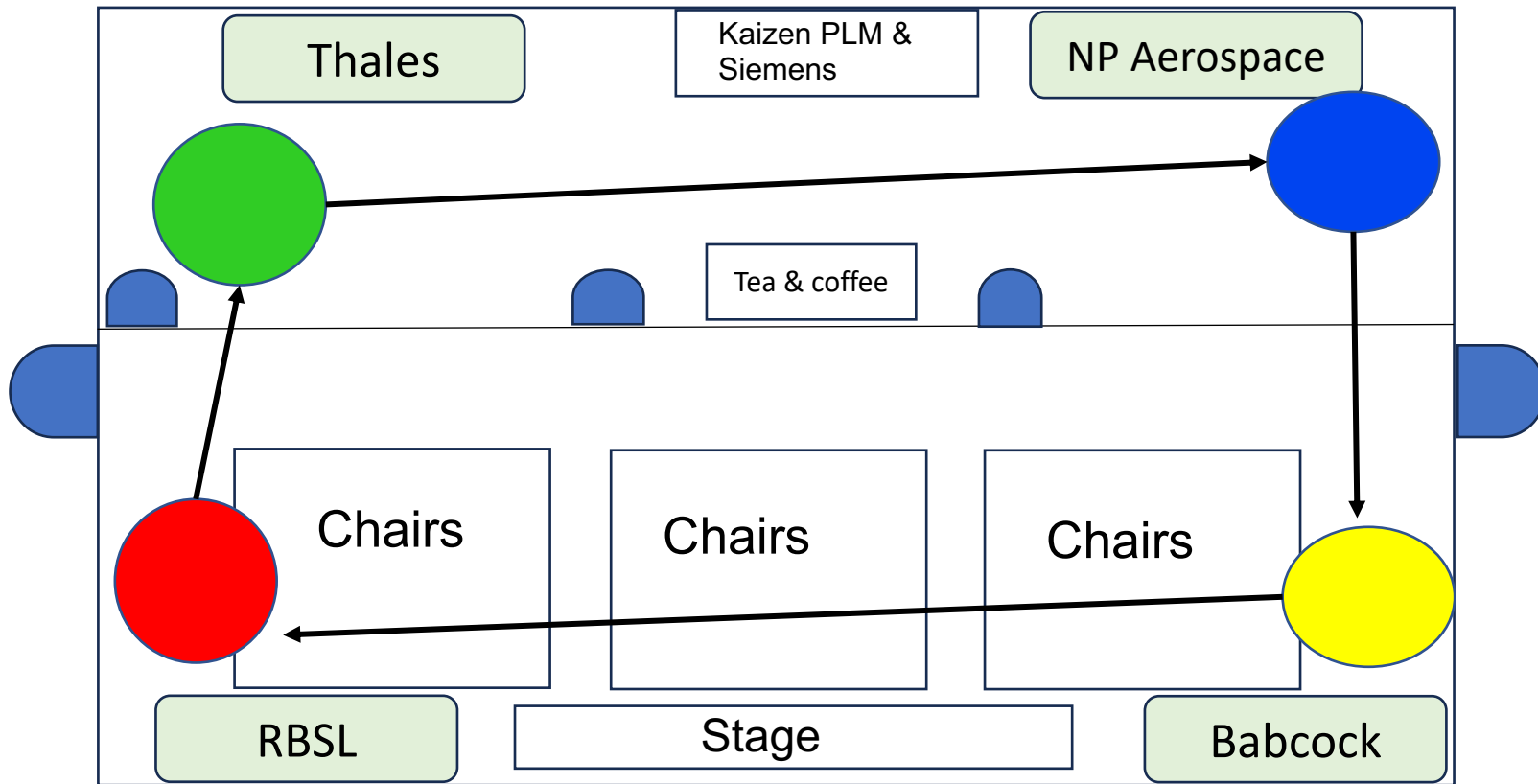
Yellow – group #3

Red – group #4

# Layout for Spiral 2 Market Stalls



# Layout for Spiral 2 Market Stalls





Strategic Command  
Defence Support

Pulse survey ->



Lunch + tour (pink dots, tour start at 13:20)  
13:00 – 14:00



Strategic Command  

---

Defence Support

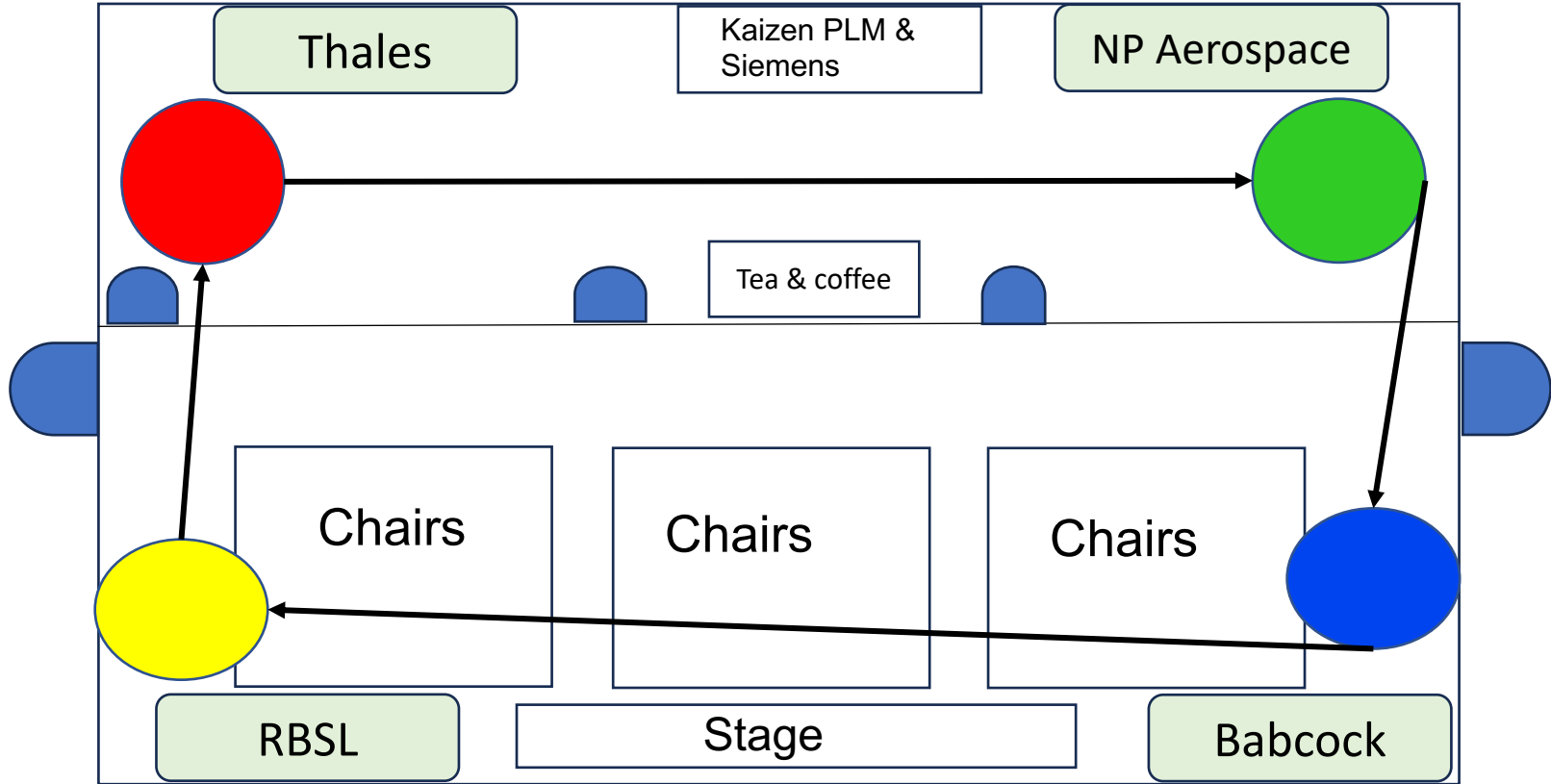
# Stalls Pt 2

Edit Barbantan

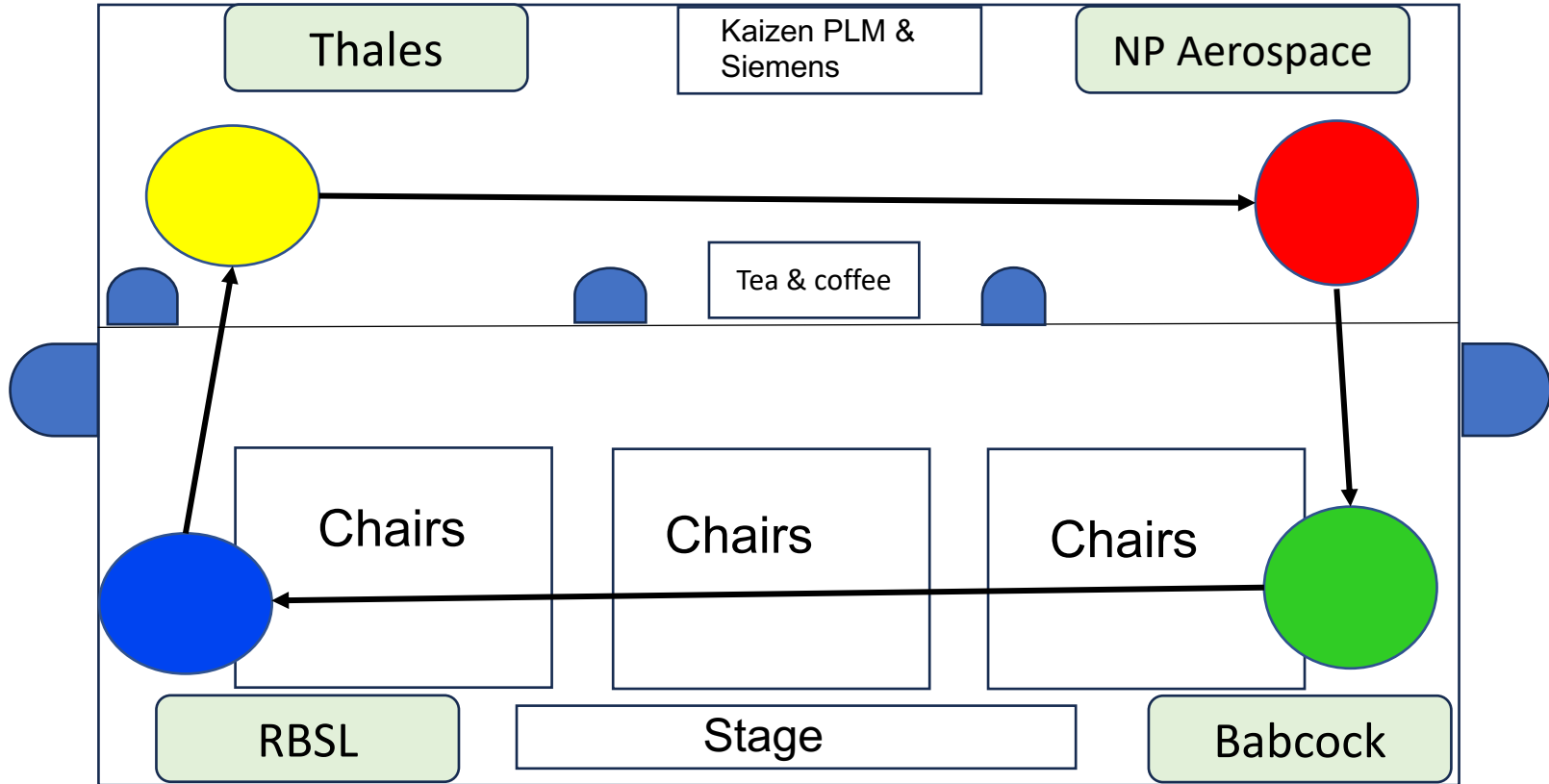
14:00-15:00



# Layout for Spiral 2 Market Stalls



# Layout for Spiral 2 Market Stalls





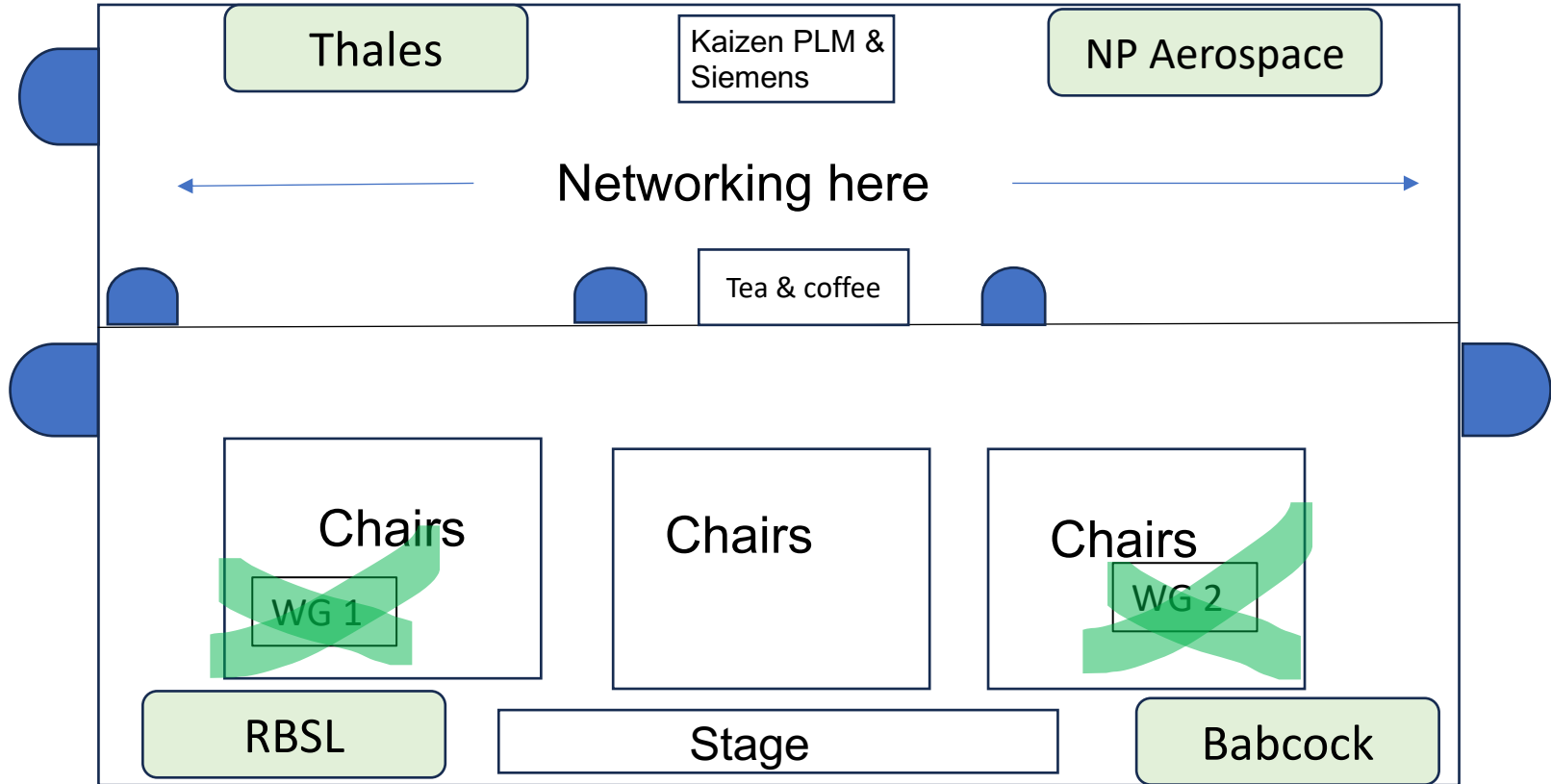
Strategic Command  
Defence Support

# Procedure for Working Groups

Edit Barbantan

15:00 – 16:00

# Layout for Working Groups





Strategic Command  
Defence Support

# WG Co-Chair Summaries & Wrap up

Charlotte Robinson & WG co-chairs

16:00 - 16:30



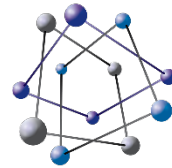
- **Certification WG** – Leonie Boyd and Charlotte Meeks
- **Inventory Management WG** – Len Pannett and Guy Hargreaves
- **Digital Thread WG** – Shelley Copplestone (and Tim Westmaas but he's not here)



THANK YOU!



SIEMENS



Kaizen PLM

