Digital Manufacturing

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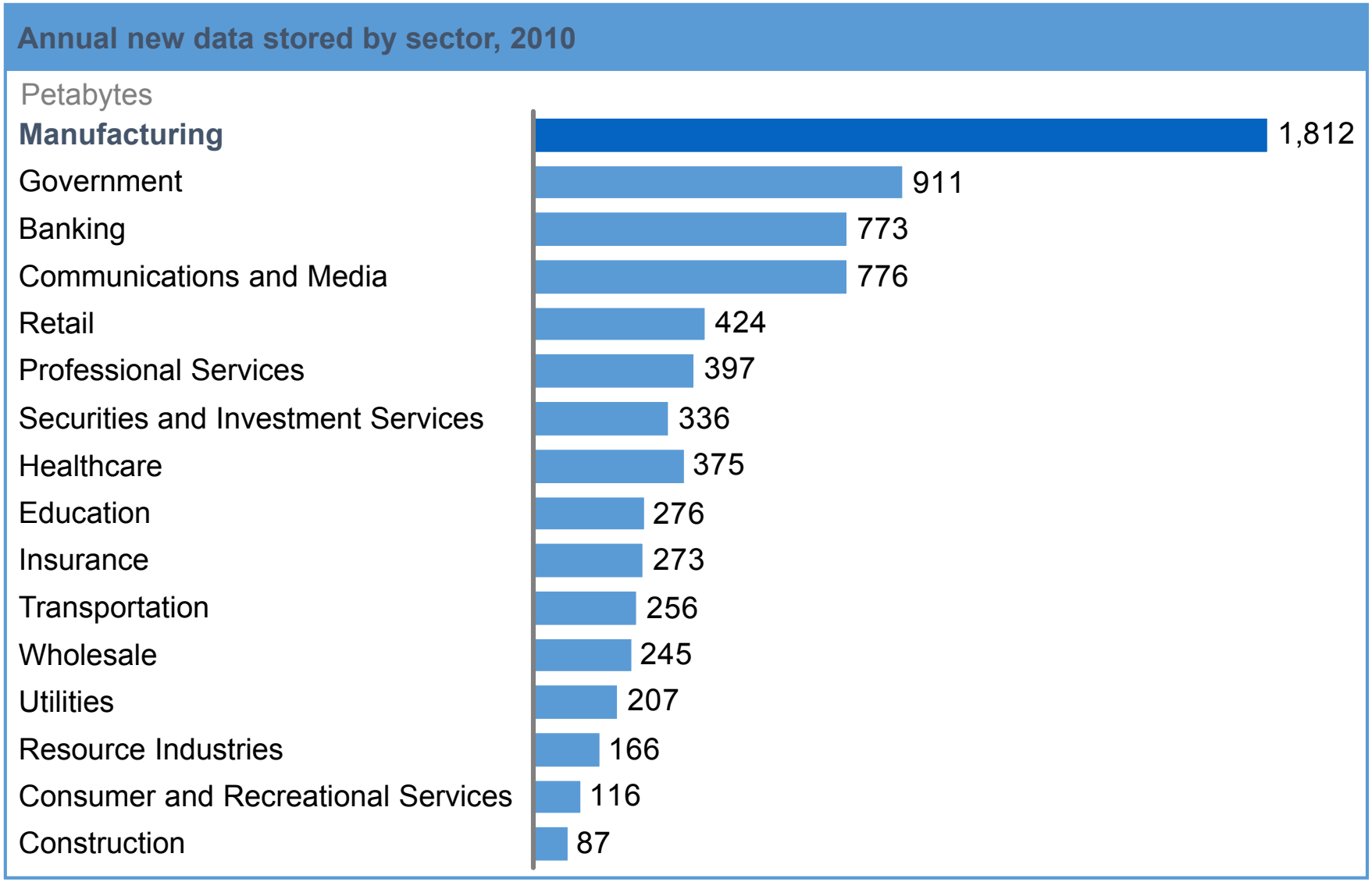
Manufacturing already generates more data than any other sector



1 Discrete manufacturing constitutes 1072 petabytes; Process manufacturing 740 petabytes

SOURCE: IDC; McKinsey Global Institute analysis

What forces are driving the digitization of manufacturing operations?

Challenges

- **Separation of designers and makers** has slowed innovation
- **Barriers for Sharing Data and Information** including: technology, skills, incentives, security, trust, IP, standards
- **Increasing cost of labor globally,** skills gap
- Rising costs of materials and **supply constraints**

Opportunities

- **Digital link** between designers and makers
- **Digital connections to physical assets** machines, factories, and supply chains
- **Data aggregation and analysis** to do more with existing resources

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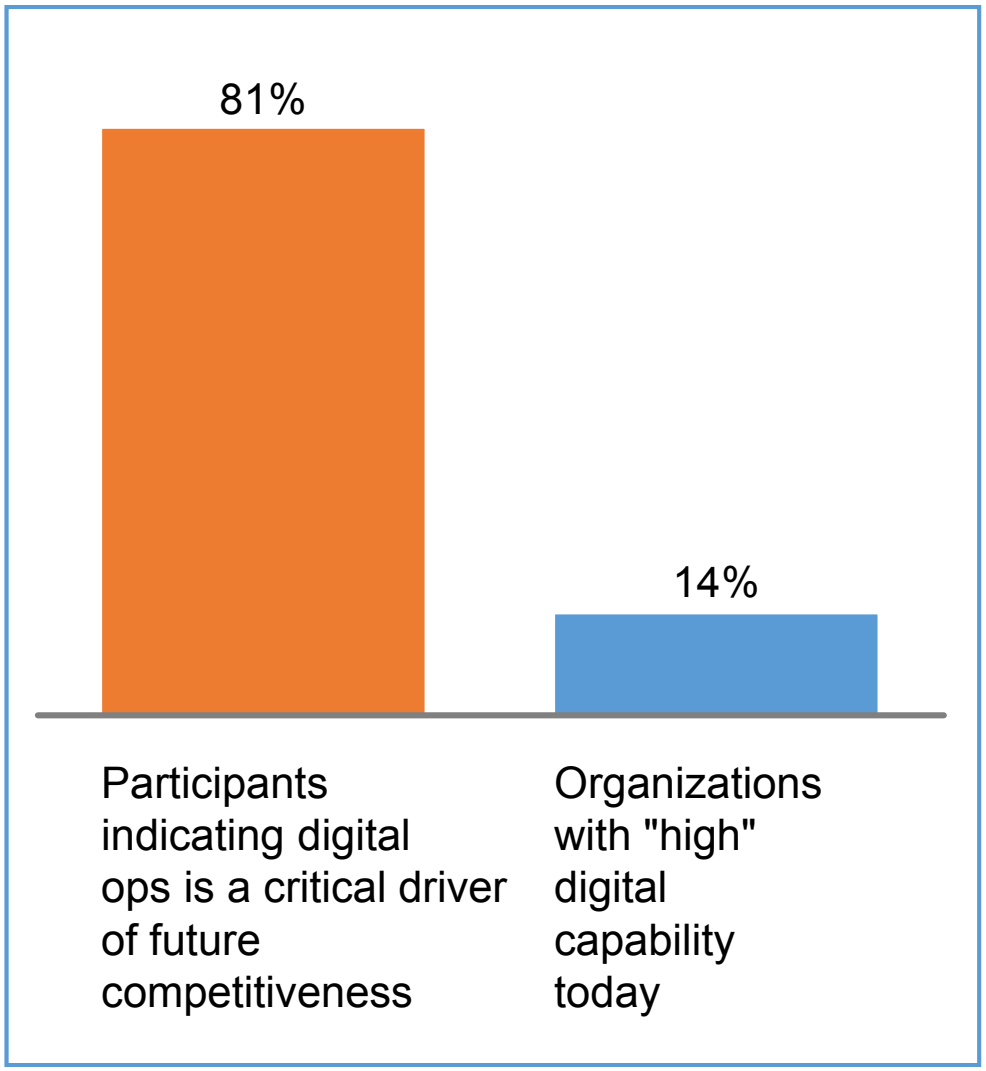
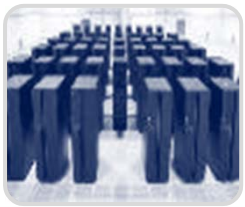
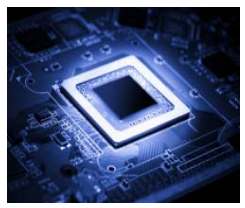
Despite the recognition of importance for digital design and manu-acturing, most organizations feel they lack the necessary capabilities







SOURCE: DMDII Survey

Digital Manufacturing and Design Innovation Institute

Public-private partnership launched in February 2014

$320M over 5 years

Sponsorship from the world's best manufacturing companies

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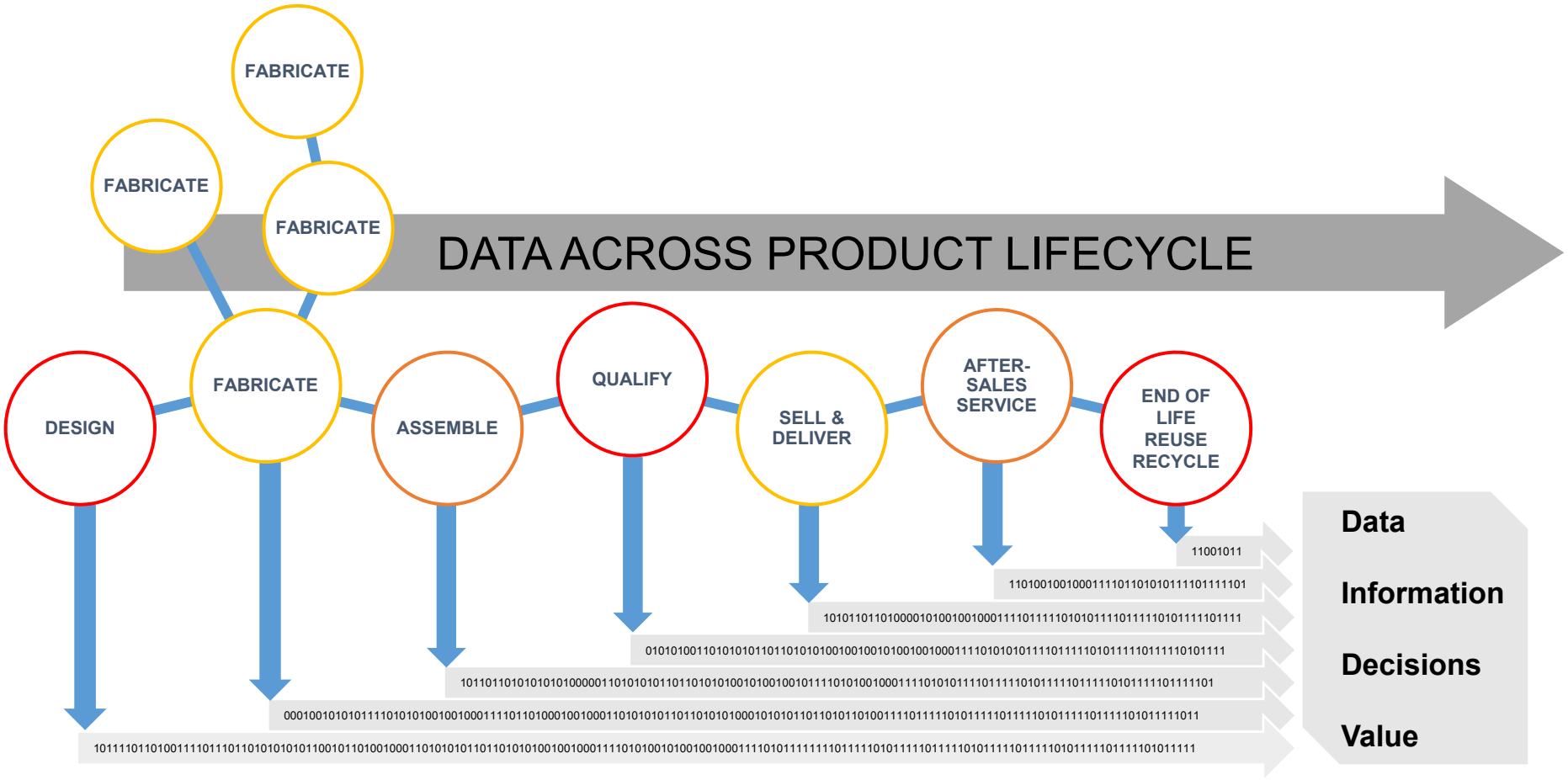
DMDII vision for digital manufacturing



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Examples of Applied Technology Projects from the DMDII Portfolio

Sample Project	Sample Impact
Real-Time Shop Floor Data Analytics: Bring mobile computing and advanced analytics to shop floor decision-making, allowing real-time adjustments to complex vehicle system assembly	Reduce rework and labor costs by up to 30%; $1MM over the life of the vehicle per hour saved in production
Intelligent Machine "Plug and Play" Solution: Machine intelligence solution for adaptive machining, allows machines to adjust based on unique shape of each cast/blank part, interoperable across CNC machines	Reduce current 50% scrap rate by half
Next-Gen Product and Process Design: Design refresh of helicopter engine. Advanced analytics and modeling software: compare as designed, as made, as assembled, as serviced data. Cloud-based collaboration for real-time exchange and co-design	Reduce total system cost by 10-15%; accelerate time to market

The Digital Manufacturing Commons

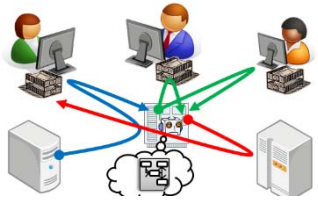
- Open Source Software Platform
- Created by GE Global Research
- Website interface, based on the Digital Object Management Engine (DOME)

Key Problems to be Solved	Solutions Enabled by the DMC
• Globally distributed teams	• Common virtual workspace
• Collaboration between designers and manufacturers requires significant manual intervention	• Streamlined workflows
• Data locked away; used only once	• Live, automatic links to archived data enables data reuse
• Synchronization of specialty expertise and algorithms	• Engineered systems based on complex service chains
• Barriers to accessing latest knowledge and analytical tools	• Service marketplace

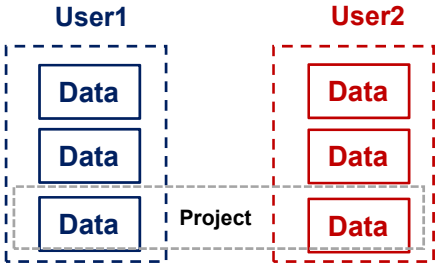
The Digital Manufacturing Commons Powered by Three Key Feature Sets

1 Collaboration Platform

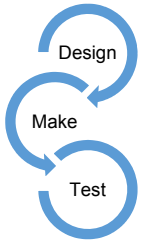
Distributed and Federated



File Sharing and Data Management



Work Flow Management

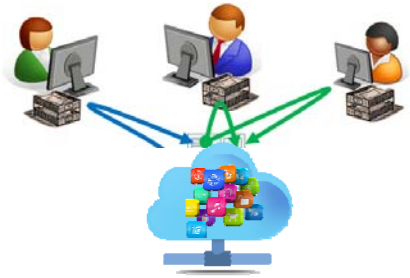


2 Digital Service Marketplace

App Space

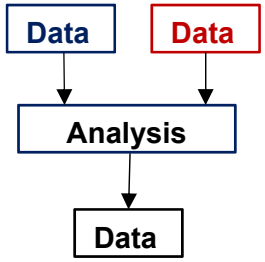
User Generated Code

Service Wrappers for Executable Code

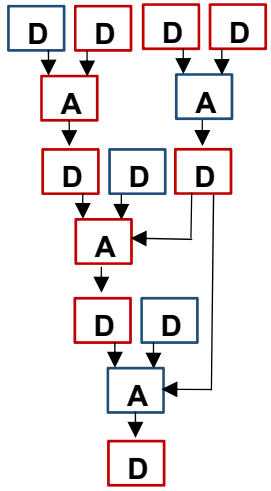


3 Systems Engineering

Advanced Composition of Service Chains



Systems of Systems



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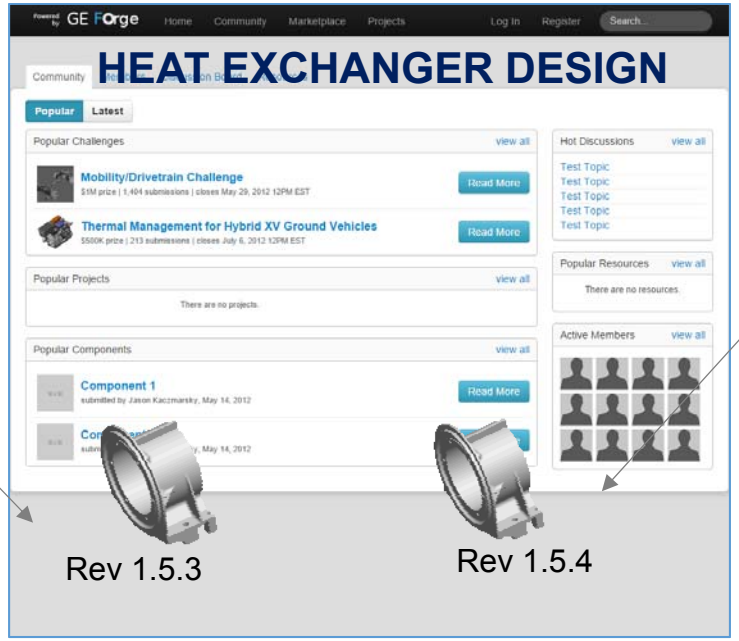
1. Collaboration Platform

Files can be uploaded and shared within a virtual project space

OEM



SUPPLIER

"Your file has been modified!"

Users can subscribe to updates and alerts

CHANGE HISTORY

12-09-15 8:40:12 new file added
12-11-15 3:32:09 geometry change
12-12-15 3:39:45
……

All changes are tracked and auditable

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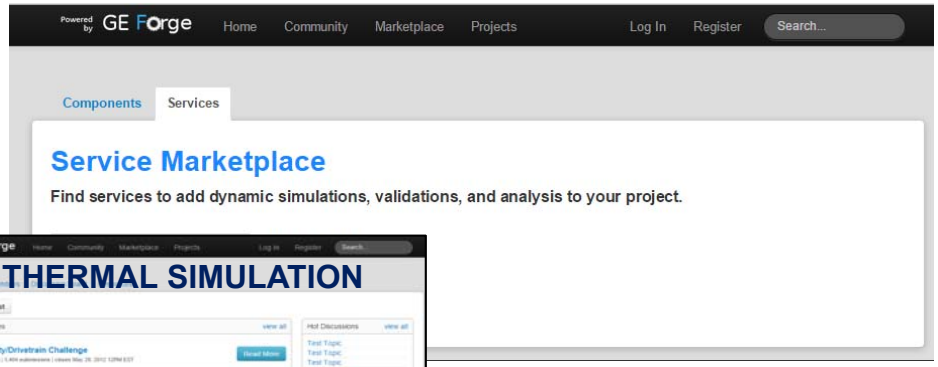
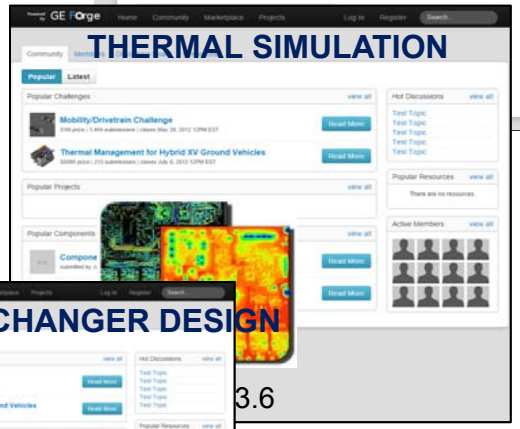
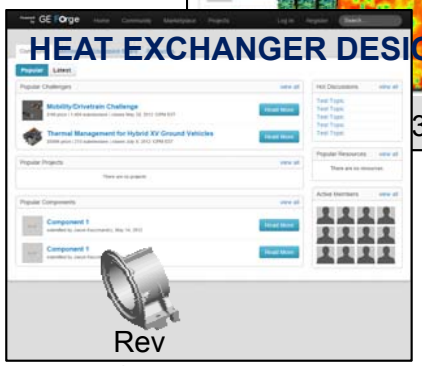
2. Digital Service Marketplace

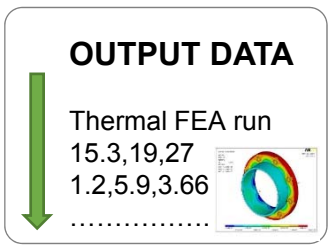
ANALYST

projects can also contain analytical software models









OEM

Both data and models can be published to the service marketplace

Where they can be discovered and run in real-time

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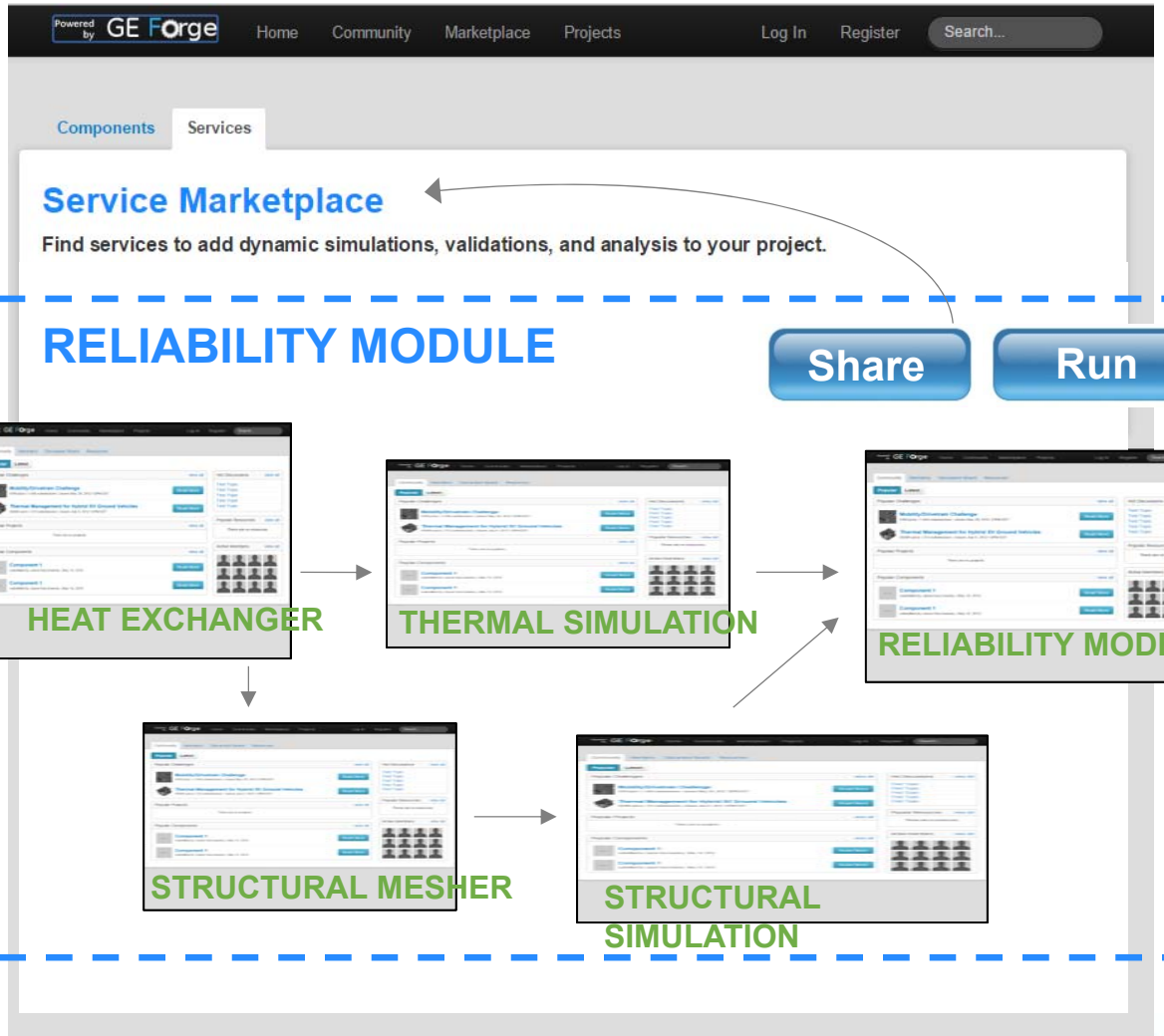
3. Systems Engineering

Data and analytical models can have their inputs and outputs chained together to create complex systems

OEM



OUTPUT DATA

Reliability analysis
15.3,19,27
1.2,5.9,3.66
.....

These can be executed and published back to the marketplace

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Digital Manufacturing: Key Takeaways

Manufacturing is on the brink of a digital disruption, which will transform the sector over the next 10+ years.

Manufacturing will become more productive, more agile, and will be a source of new business growth.

You can participate in DMDII
http://www.dmdii.uilabs.org/

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