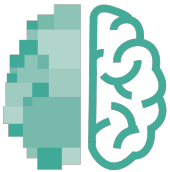

DIGITBRAIN

Webinar on 2nd Open Call
Which experiments/use cases are we looking for?

Prof Dr André Stork
Fraunhofer
Scientific / Tech. Coordinator

10.03.2022

DIGITbrain has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952071

Which experiments/use cases are we looking for?

Enabling customised **Industrial Products** and facilitating cost-effective distributed and localised production for manufacturing SMEs, by means of leveraging edge-, cloud- and HPC-based modelling, simulation, optimisation, analytics, and machine learning tools and by means of augmenting the concept of **Digital Twin** with a memorising capacity towards:

- Industrial Products (IPs) aka Manufacturing “machines”
- Digital Twins, i.e. modelling / analyzing “some behaviour” of IPs

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Which experiments/use cases are we looking for?

Application experiments shall do so by developing, using, exploiting **Digital Twins.** In DIGITbrain Digital Twins are conceived being formal digital representations of some asset, process or system that captures attributes and behaviours of that entity, and suitable for communication, storage, interpretation or processing within a certain context. The Digital Twin information includes, but is not limited to, combinations of the following categories:

- Physics-based model and data,
- Analytical models and data,
- Time-series data and historians,
- Transactional data, master data, visual data and
- Computations performed by executing implementations of algorithms which evaluate models.

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Which experiments/use cases are we looking for?

- DIGITbrain wants experiment partners to **separate between Algorithms, Models and Data. Why?**
  - To boost potential **re-use** of these "assets", individually
  - To **enable individual monetarization** in the commercialization phase
    - Commercialization of results for the experiment partners' results via the Digital Agora (Marketplace is an expected experiment goal)
    - The Digital Agora is an additional marketing channel for experiment partners

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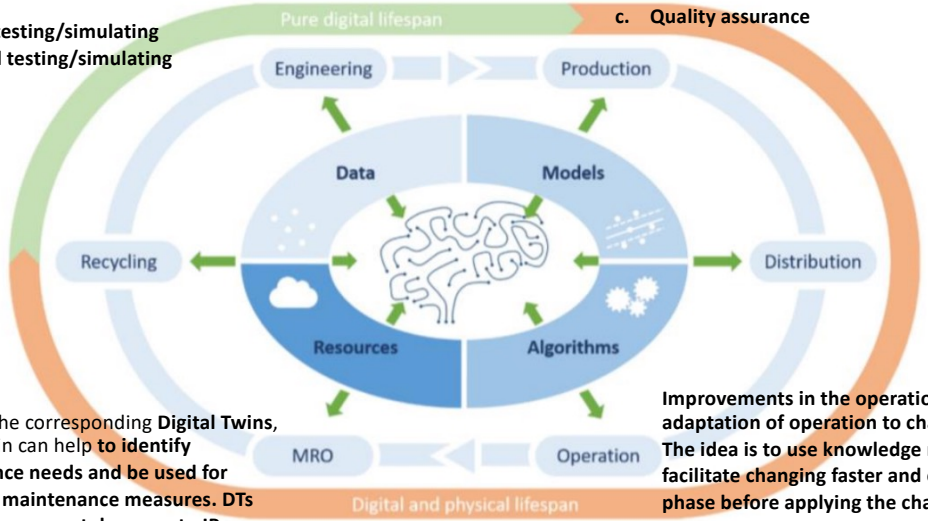
Which experiments/use cases are we looking for?

a. Design
   a. Design a new Industrial Product (IP)
   b. Adapt IP based on insights derived from DTs in the Db
   c. Re-design and evolve an IP to a next-gen version
b. Engineering
   a. virtual testing/simulating
   b. physical testing/simulating

a. Production engineering / **Production planning**
b. Producing and monitoring
c. Quality assurance



The LCA activities and models within DIGITbBrain are addressing recycling and support to evolution of ever **more eco-friendly IP design and operation of IPs.**

e.g. "distribution" of production capacity

Provided the corresponding **Digital Twins**, DIGITbBrain can help **to identify maintenance needs and be used for predictive maintenance measures. DTs may help to prevent damages to IPs.**

Improvements in the operation phase aim for faster adaptation of operation to changing requirements. The idea is to use knowledge represented in DTs to facilitate changing faster and easing the virtual testing phase before applying the change on an IP.

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Which experiments/use cases are we looking for?

Expected benefits for experiment partners (stakeholders) - examples:

- Manufacturers of Industrial Products (manufacturing machinery, CPS)
- Manufacturing companies (users of Industrial Products)
- Algorithm Providers/Suppliers (RTO / ISV / VAR)
- Model Providers/Developers (RTO / ISV / VAR/ Consultants)
- etc.

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Which experiments/use cases are we looking for?

Examples of benefits per type of stakeholders (excerpt):

- Manufacturers of Industrial Products (manufacturing machinery, CPS)

Who?	Manufacturers of Industrial Products (manufacturing machinery, CPS)
Which benefit?	DIGITbrain Solution as a central point of access to information on virtual IP Instances and families of Industrial Products • Easier and faster creation of Digital Twins • Flexible execution on different resources • Documentation of evolution across engineering domains, data involved (consumed and generated) • Comprehensible decision-making
How?	Manage and maintain information (Assets) related to virtual IP Instances and families of Industrial Products: • Manage the Assets • Create Digital Twins • Evaluate Models and execute Algorithm on local and remote resources to perform virtual simulations • Use simulation results to refine digital models • Document and track the provenance of evolution

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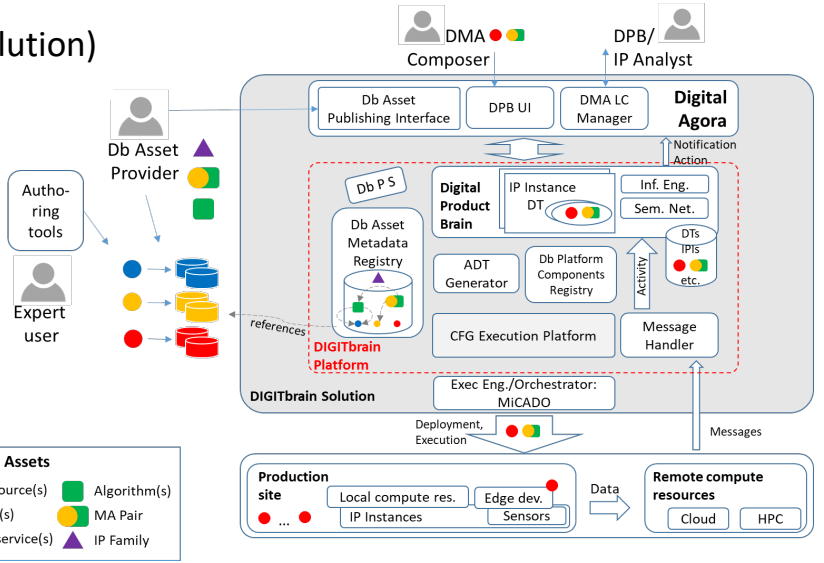
What do we offer? The DIGITbrain Solution

DIGITbrain Solution (under evolution)

All the complexity in the figure to make your life easier on the long run

Expertise / consultancy

Tools
however, it is expected that you bring your own to further populate the Digital Agora



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What do (technical) experiment partners have to do?

Technical developments within the respective experiment typically comprises:

- Design, develop, apply, verify Digital Twins for Industrial Product instances and selected behaviour
- Provide / adapt corresponding software tools and containerize them
  - simulation, optimisation, analytics, machine learning, etc.
- Provide
  - Assets: Model, Data, Algorithm on repositories
  - connectors to factory data sources if experiment requires
  - Apps for visualizing results of Model evaluation and human computer interaction

Showcase benefits for

- customisation of Industrial Products / Production Processes and
- cost-effective distributed and localised production
- for evolution and improvement of next generation Industrial Products

by applying Digital Twins

- on one instance of Industrial Products
- on many instances of Industrial Products (cohort analysis)

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What does it mean to integrate with DIGITbrain?

Firstly, there is hardly any integration needed to be done on an API level with DIGITbrain. Integration is mostly done by a “publishing procedure”:

- Optional: modularization of existing software tool(s)
- Containerize your software tool(s) -> Microservices
  - Docker and Linux preferred
    - deployment and execution is automatic in Db leveraging edge, cloud and HPC computing
  - Data connectors are considered Microservices and need to be developed/provided by the experiment partners
- “Publishing” your Algorithm, Model and Data to the DIGITbrain Solution via the DIGITbrain Asset Publishing Interface,
  - i.e. filling values in our Db Metadata structure
- Define conditions to trigger messages stored/memorized in the Digital Product Brain
  - conditions act on output of evaluated Models
- Optional: providing visualisation app(s) with specific functionality
  - e.g. acting on data generated by the Digital Twin
- Publish company profile in Digital Agora

NB: There are some more activities in the commercialization strand being done in collaboration with you!

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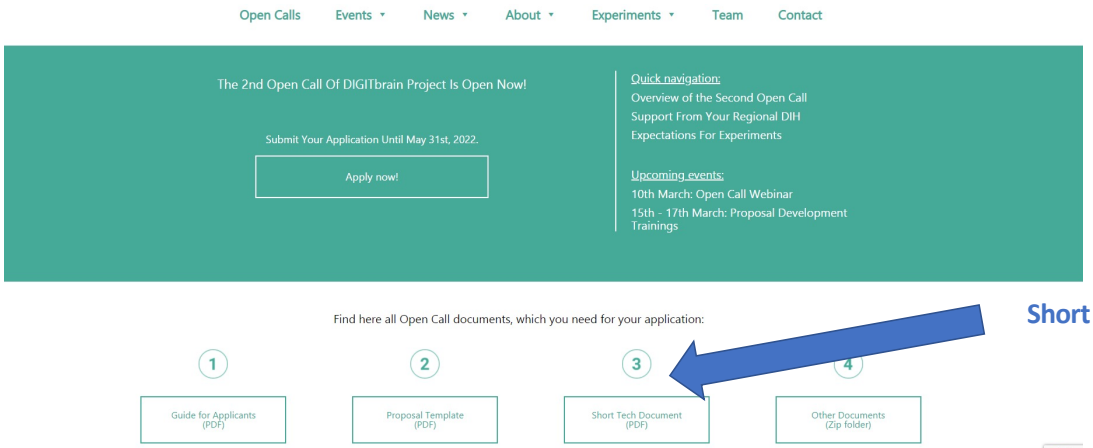
Further technical information

- https://digitbrain.eu/open-calls/



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Short tech doc

DIGITBRAIN

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DIGITBRAIN

Q&A

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Which experiments/use cases are we looking for?

Examples of benefits per type of stakeholders (excerpt):

- Manufacturers of Industrial Products (manufacturing machinery, CPS)

Where/when in PLC?	Engineering
Which benefit?	DIGITbrain Solution as a central point of access to information on physical Industrial Product Instances (hereafter IPIs) manufactured
How?	Document each IPI produced in DIGITbrain Solution: • Its configuration • QA results • the client • etc.
Where/when in PLC?	**Production**

Which benefit?	DIGITbrain Solution as a central point of access to information from Industrial Product Instances (IPIs) "working in the field", i.e. the ones delivered to customers in order to:
	• Optimize settings for IPIs
	  ○ Maximize output
	  ○ Reduce energy consumption
	  ○ Reduce wear and tear
	• Minimize break-down times in a MaaS setting
	• Learn from the data/insights to improve next product generation
	• Improve customer experience (customer = IPI Operator)

Horizon 2020
No 952071

Which experiments/use cases are we looking for?

Examples of benefits per type of stakeholders (excerpt):

- Manufacturing companies (users of Industrial Products)

Who?	Manufacturing companies (users of Industrial Products)

Which benefit?	Especially in case of mobile IP Instances:
	• better planning of how and where to deploy the IPI to
	  ○ maximize occupancy rate of IP Instances (maximizing through- and output)
	  ○ faster react to changing conditions

How?	• Knowing demands and run production/operation planning simulations to optimize "distribution" of production capabilities represented by the (mobile) IP Instances

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Which experiments/use cases are we looking for?

Examples of benefits per type of stakeholders (excerpt):

- Manufacturing companies (users of Industrial Products)

Where/when in PLC?	Operation
Which benefit?	• Minimize maintenance work and efforts • Predict maintenance necessities • Minimize and schedule repair efforts • Minimize wear and tear • Better plan overhauling
How?	See IP Manufacturer
Where/when in PLC?	MRO

NB: the benefits depend on the Models published to DIGITbrain Solution

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