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Open Science

Helmholtz Open Science Briefing

2nd Helmholtz Open Science Forum "Open Science and Transfer"

Report

Imprint

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Abstract

On January 22, 2024 the Helmholtz Open Science Office hosted the Second Helmholtz Open Science Forum on the topic of Open Science and Transfer. The online event addressed various aspects and issues around the interplay of Open Science, Technology Transfer, Knowledge Transfer and Citizen Science at the Helmholtz Association. Together with the participants important overlaps were identified against the backdrop of the digital transformation. Open science as a standard for scientific work creates foundations for successful transfer - and both topics can complement each other very well.

The Helmholtz-internal event gave insights into current projects and initiatives relating to transfer to society, business and industry. Moreover, Helmholtz initiatives for Citizen Science and the successful practical implementation of Open Hardware were presented. The event also offered opportunities for networking and the exchange of ideas. This report documents the Second Helmholtz Open Science Forum on Open Science and Transfer.

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Introduction and Program

Open science and transfer are central fields of action at Helmholtz that do not exclude, but rather complement each other well in many respects. Particularly important overlaps can be identified against the backdrop of the digital transformation: Open science as a standard for scientific work creates foundations for successful knowledge and technology transfer. This is also manifested in the Helmholtz Transfer Strategy[1] and the Helmholtz Open Science Policy[2]. The forum focused in particular on the aspect that open science practices and exploitation (as an aspect of transfer) are going hand in hand.

After an initial Helmholtz Open Science Forum on "Open Science and Transfer" in May 2022[3] that brought together Helmholtz-actors on both action fields together for the first time, the Helmholtz Open Science Office, after consultation and coordination with Helmholtz stakeholders in transfer, invited stakeholders from Helmholtz to a second Helmholtz Open Science Forum on "Open Science and Transfer" to further strengthen the communication at Helmholtz and between actors of both areas. Awareness was raised for the manifold facettes of Open Science and Transfer in a diverse research environment as represented by the Associations' Centres.

The 75 participants were given exciting insights into current projects and initiatives relating to transfer to society, business and industry by the invited speakers (Tab. 1). This also included an overview of Helmholtz initiatives for citizen participation in research projects (Citizen Science) and the successful practical implementation of Open Hardware projects. The event was a good opportunity for the contributing initiatives and projects to present their results and work to a broad and diverse Helmholtz-audience and to network and identify possible co-operations.

The event and the resulting discussions underlined the general consensus within Helmholtz that open science and transfer, as two central areas of action at Helmholtz, complement each other well in many respects. At the same time, there is a further need to discuss how these cross-relationships can be made more fruitful for Helmholtz.

This report documents the event; the speakers' slides can be found in the appendix of this report (from p. 10).

1 https://www.helmholtz.de/en/transfer/transfer-strategy/
2 https://os.helmholtz.de/en/open-science-in-helmholtz/open-science-policy/
3 https://doi.org/10.48440/os.helmholtz.051

Program	Speaker
Welcome	Roland Bertelmann, Helmholtz Open Science Office
Open Source Program Office at CERN - Concept and Implementatio	Sünje Dallmeier-Tiessen, CERN
Das Digital Open Lab der GSI	Tobias Engert, GSI Helmholtzzentrum für Schwerionenforschung GmbH
SoftWert – Verwertung von Forschungssoftware erfolgreich gestalten	Zahra Saleh, Janine Fischer, Deutsches Elektronen-Synchrotron DESY Lisa Wenzel, German Research Centre for Geosciences GFZ
Citizen Science und Partizipation @Helmholtz	Julia von Gönner, Helmholtz Centre for Environmental Research UFZ Christin Liedtke, Helmholtz Head Office
OpenTransfer – Open Science and Transfer Icebreaker: Open Toolbox for Technology Transfer; Reasons, Goals & Strategy	Vladimir Voroshnin, Helmholtz-Zentrum Dresden-Rossendorf HZDR
OpenFlexure Microscope - Open Hardware in practice	Julian Stirling, Freelancer

Table 1: Program of the 2nd Helmholtz Open Science Forum "Open Science and Transfer", January 22, 2024

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Documentation of the Forum

Welcome

Roland Bertelmann, Head of the Helmholtz Open Science Office, kicked-off the event by welcoming the speakers and the audience to the second Helmholtz Open Science Forum on Open Science and Transfer. In his introductory words he underlined that Open Science and Transfer are not two areas of action that stand isolated next to each other. There is quite an amount of overlap and interplay between both of them, but they may not be so obvious that they can be recognized immediately. As stated in the strategic positioning of the Helmholtz Open Science Policy[4]:

> *"...drive to **make the results** of their own work **publicly available to science, industry, and society for reuse with as few barriers as possible**, the Helmholtz Centers call on their employees to make research results achieved alone or in collaboration with other researchers in the course of their work for **Helmholtz** open and reusable whenever possible according the principle of intelligent openness - that is, "as open as possible and as closed as necessary."*

Therefore, this event was another good opportunity to address the great need for discussion on how these crosslinks can be made more fruitful for Helmholtz.

Open Source Program Office (OSPO) at CERN - Concept and Implementation[5]

Sünje Dallmeier-Tiessen, who is in charge of the Open Science Office at CERN, started the row of talks by presenting the concept of Open Source Program Offices (OSPOs) and the conceptualization an implementation of such an OSPO at CERN.

OSPOs have emerged as pivotal components in organizations seeking to consistently practice, embrace and contribute to open-source software developments At CERN, the European Organization for Nuclear Research, an OSPO has recently been implemented to support the organization's unique mission of advancing openness and collaboration. CERN's OSPO is jointly run by appointed members of the majority of the departments enabling a direct connection to the diverse and large community at CERN.

The presentation delved into the structure and mission of the CERN OSPO, by exploring the pathway to its conception and launch and outlining how CERN went beyond the standard idea of an OSPO by including hardware and focusing on community building. Details of the OSPO concept were presented, focusing on its application at CERN and the associated implementation challenges. The presentation outlined some of them, and additionally focused

4 https://os.helmholtz.de/en/open-science-in-helmholtz/open-science-policy/
5 The slides of this and all other presentations are attached to this document.

on the implementation phase in 2024 which entailed both the development of concrete services, such as a catalogue and technical documentation, and community work at CERN.

The talk provided practical insights into the establishment of an OSPO as well as suggestions on how to overcome some challenges observed. It was offering valuable lessons for organizations or teams navigating open-source strategies. Furthermore, it provided some ideas to explore during the year 2024 at CERN and beyond.

Das Digital Open Lab der GSI

Tobias Engert, Direction of the department Technology Transfer at GSI Helmholtzzentrum für Schwerionenforschung GmbH, presented the GSI/FAIR Digital Open Lab. Within GSI's own High-performance computation "Green IT Cube" the "Digital Open Lab" provides the environment for the development, testing and upscaling of energy-efficient High-Performance-Computing up to the scale of industrial demonstrators.

The presentation introduced how this real-world laboratory / innovation & test data center helps to optimally match computer and storage systems with the respective application-specific requirements in terms of performance, time load distribution and other things in various operating modes and system configurations to an efficient cooling system.

The talk underlined the the services offered by the Digital Open Lab are aimed at private and public partners and focus on three key areas: (1) Joint Research and Development by providing the infrastructure and IT expertise of GSI and FAIR for joint development projects in the fields of High-Performance-Computing (HPC), Big Data and ultra-fast data collection; including software developments and products. (2) Collaborations by enabling access to HPC systems and projects for external partners via collaboration projects. (3) Provision of Rackspace by offering services in the data center.

SoftWert - Verwertung von Forschungs-software erfolgreich gestalten

The following presentation by Zahra Saleh and Janine Fischer from Deutsches Elektronen-Synchrotron DESY, together with Lisa Wenzel from the German Research Centre for Geosciences GFZ shifted the focus on the successful utilization and exploitation of research software. At DESY Zahra Saleh is working as an Innovation Manager while Janine Fischer is a Technology Transfer Officer. Lisa Wenzel is working as a Transfer Manager at GFZ.

There are now only a few areas in which research can be carried out without software. Research software is not only an increasingly important key component in scientific work and an essential part of the research infrastructure, but is also becoming more significant for utilization and transfer. Research software is created either as the main product of a research and development project or as a by-product of scientific activities. The awareness that software is a valuable resource in the research landscape, which can either be marketed

commercially or made available non-commercially (e.g. open source), is growing rapidly. By transferring software to the economy and society, research can make an effective contribution to solving current challenges facing our society.

In knowledge and technology transfer of German research institutions, there is a great need for suitable methods and approaches that support teams in transfer and innovation management in successfully utilizing research software. A systematic and well thought-out approach to exploiting the valuable resource of software is essential.

The talk presented a toolkit for the exploitation of research software that has been developed within the SoftWert project, which is funded by the German Federal Ministry of Education and Research (BMBF) and where the German Electron Synchrotron DESY in Hamburg, the German Research Centre for Geosciences GFZ in Potsdam, the German Center for Neurodegenerative Diseases (DZNE) in Bonn and Saarland University joined forces.

The toolkit is intended to support the transfer of knowledge and technology and simplify the commercial and non-commercial exploitation of research software. In the SoftWert project, new approaches for processes and structures in the transfer area for dealing with research software were tested.

In addition, guidelines and tools for evaluating the exploitation potential of research software were developed, decision-making aids for suitable transfer channels were examined and good practices and recommendations for action for successful business model development were developed.

Citizen Science und Partizipation @Helmholtz

The next presentation focused on another very important aspect and stakeholder of transfer activities - the civil society. Julia von Gönner from Helmholtz Centre for Environmental Research UFZ and Christin Liedtke from the Helmholtz Head Office introduced the participants of the event to the activities around Citizen Science and Participation at the Helmholtz Association. While Julia von Gönner, amongst other things, coordinates the nationwide Citizen Science Stream-monitoring project "FLOW", Christin Liedtke is science communication officer and the contact person for Citizen Science at Helmholtz. Both were lead authors of the white book "Citizen Science Strategy 2030 for Germany"[6].

Citizen Science and Open Science are approaches that contribute to transforming scientific research. Citizen Science actively involves citizens in the scientific process by involving them as partners in data collection, analysis and interpretation of research projects. This participatory approach not only creates a broader database, but also promotes understanding of scientific topics and strengthens trust between science and society. Open science, on the other hand, refers to free and transparent access to scientific knowledge, data and resources. The concept of Open Science and resulting disclosure of research results and data encourages innovation, improves reproducibility and promotes collaboration in research. These principles

6 https://www.ufz.de/export/data/2/270430_CS_Strategy2030_Germany_Whitebook.pdf

of openness and collaboration are central and highly relevant in finding solutions to urgent, current societal challenges. These characteristics make Citizen Science and Open Science important instruments for the promotion of participatory and transparent science. The presentation took a closer look at the basics of Citizen Science, the process of the last two years at Helmholtz and the current status quo.

OpenTransfer – Open Science and Transfer Icebreaker: Open Toolbox for Technology Transfer; Reasons, Goals & Strategy[7]

After the lunch break Vladimir Voroshnin from Helmholtz-Zentrum Dresden-Rossendorf HZDR put a focus on the Technology Transfer and Open Science by presenting the Project "OpenTransfer" which is a paradigm-shifting approach to Technology Transfer rooted in Open Science. He is an Innovation Manager for the project OpenTransfer.

The initiative redefines access in the technology landscape, aiming to make innovations faster, cheaper, and more efficient by making the development process more collaborative and less intellectual-property-based bottlenecked.

The primary goal behind Technology Transfer is a utilization of the scientific results. The primary objective is maximizing the transferred knowledge's social and economic impact- not maximizing the particular institution's profit. Protecting intellectual property (e.g., patents) is the means and not a goal. There is no contradiction between Open Science knowledge decimation and Technology Transfer impact maximization notions.

Nowadays, the primary way of Technology Transfer operation is to secure intellectual property and use it as leverage for market negotiations to form a competitive advantage and a market value. However, often openness can also bring additional value and generate community leverage for the product. OpenTransfer aims to find out and utilize the usage of openness for impact maximization. The software domain has dramatically benefited from open-source approaches, significantly reducing R&D and innovation costs. The core value of openness is collaborative development, investments and usage of commons. For example, once a digital common is created, it is scalable with meager costs.

Europe is experiencing a strategic shift towards openness and open-based collaborations. OpenTransfer is developing the open notion in the Technology Transfer domain. The major challenge of openness in Technology Transfer is economic sustainability and industrial partners' adoption. The presentation addresses both challenges with successful examples of open-based business models.

7 The slides of this talk and a self-made recording of the presentation are also available at Zenodo: https://zenodo.org/doi/10.5281/zenodo.10551755

Open Hardware in practice - OpenFlexure Microscope

The final point in the presentation session was set by Julian Stirling, freelance-researcher and open-technology consultant who showed the participants how Open Hardware can work in practice.

There is far more to open hardware than simply sharing a final design. The power of Open Source comes from opportunities to collaborate and to build upon the works of others. This requires a significant pool of information about the design and design process to be available. Collaboration also requires established workflows and tools for collaboration. As open Open Source Software has thrived, the tools and methods for development, collaboration, and distribution have matured creating a readily available ecosystem for new software projects to thrive. Open Hardware is much younger and its development is more complex. As such, the practices for open hardware are still evolving rapidly, and much of the tooling needed is improvised.

The talk described the development of the OpenFlexure Microscope, a motorized laboratory-grade 3D-printed microscope. The microscope is designed to be manufactured and maintained locally in sub-Saharan Africa, providing a sustainable supply of microscopes for local needs. The microscope is being trialed for Malaria diagnosis in Tanzania. The local manufacturing partners are working towards establishing the microscope as the first in-vitro diagnostic device to be manufactured in Tanzania.

The development of complex instrumentation requires significant design control and quality management. The talk explored how the OpenFlexure Microscope-team has developed new workflows and associated software to support the microscope's development.

Outlook

The forum has once again shown that the approach of considering the diversity of transfer together with Open Science is very fruitful. However, there is certainly still a need to maintain the exchange and raise awareness among researchers and multipliers from science management for the positive results of intelligent openness in conjunction with transfer activities.

Best practices from the centers on this productive completion of the topics should continue to be collected and presented. In the cooperation between the various actors and departments in the centers on transfer and open science, models can be tested and further improved. It remains to be considered what incentives can be used to further strengthen this productive cooperation.

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Appendix

Presentation Slides

- "Open Source Program Office (OSPO) at CERN – Concept and Implementation" - Sünje Dallmeier-Tiessen, CERN
- "Das Digital Open Lab der GSI" - Tobias Engert, GSI Helmholtzzentrum für Schwerionenforschung GmbH"
- SoftWert – Verwertung von Forschungs-software erfolgreich gestalten" - Zahra Saleh and Janine Fischer, Deutsches Elektronen-Synchrotron DESY, Lisa Wenzel, German Research Centre for Geosciences GFZ
- "Citizen Science und Partizipation @Helmholtz" - Julia von Gönner, Helmholtz Centre for Environmental Research UFZ and Christin Liedtke, Helmholtz Head Office
- "OpenTransfer – Open Science and Transfer Icebreaker: Open Toolbox for Technology Transfer; Reasons, Goals & Strategy" - Vladimir Voroshnin, Helmholtz-Zentrum Dresden-Rossendorf HZDR
- "Open Hardware in practice - OpenFlexure Microscope" - Julian Stirling, freelance-researcher and open-technology consultant

Open Source Program Office (OSPO) at CERN

Dr Sünje Dallmeier-Tiessen with slide contributions by Axel Naumann and Han Dols

OSPO: Open.Source@cern.ch

January 2024

Agenda

1 Introduction to Open Science and the OSPO at CERN

2 OSPO mandate

3 Why are we doing this? (aka: Taking on a different perspective)

4 The way ahead

“…and the results of its experimental and theoretical work shall be published or otherwise made generally available”

CERN Founding Convention (1953)

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

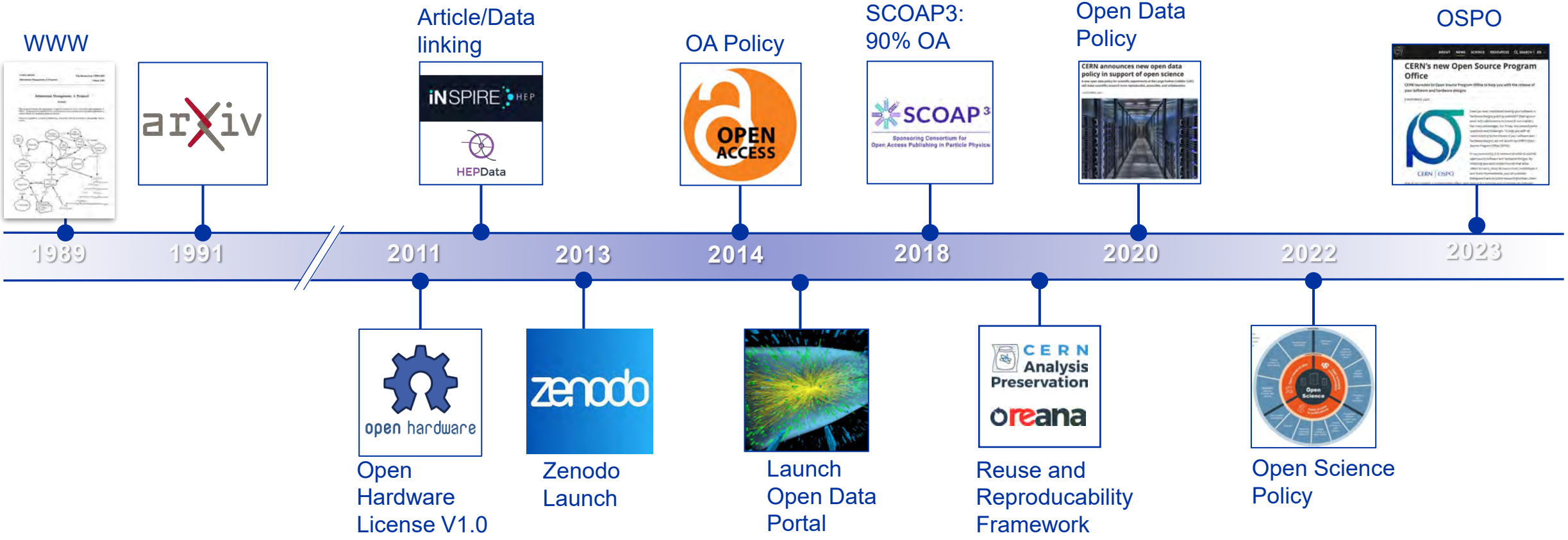
CONVENTION

FOR THE ESTABLISHMENT OF A EUROPEAN ORGANIZATION
FOR NUCLEAR RESEARCH

PARIS, 1st JULY, 1953

Illustration by Stephanie van de Sandt

CERN – Driving Open Science Globally



Policy framework for Open Science at CERN

CERN Open Access Policy (2014)

- All CERN research articles published OA (CC-BY)
- Central fund available
- Different routes (SCOAP^3, Read & Publish, APC payment)

LHC Open Data Policy (2020)

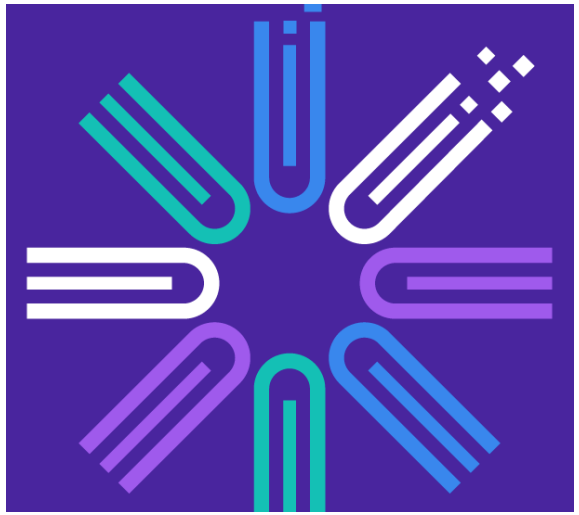
- 4 LHC collaborations will release all level 3 data (+ level 1 and 2)
- Gradual release will start ~5 years after collection
- Other experiments to follow

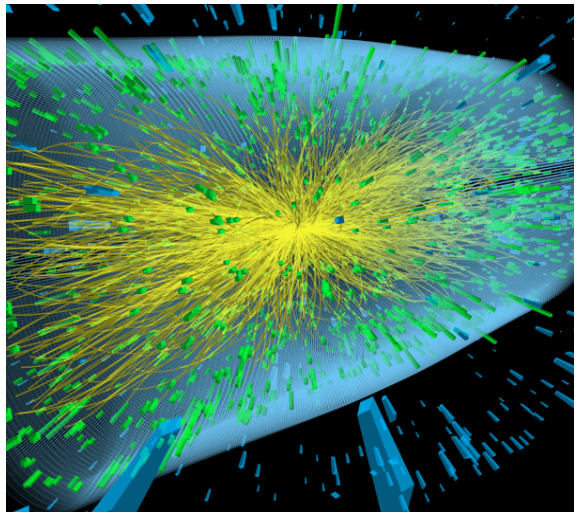
European Strategy for Particle Physics(2020)

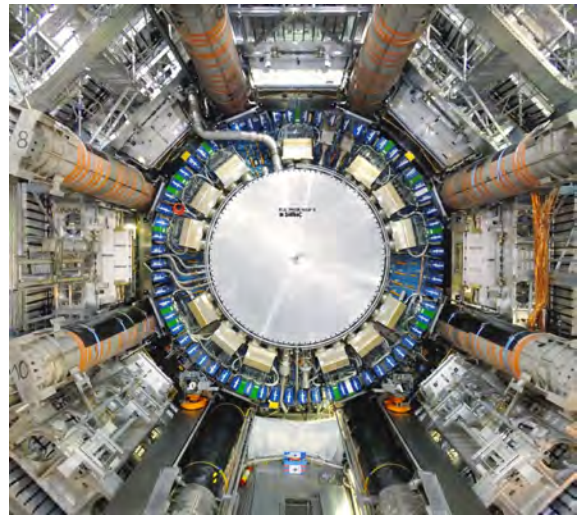
- OS recognized as organizational issue for the discipline
- Should develop and implement an OS policy for the field

Funder Open Science Policies

- Funding agencies supporting experimental collaborations have specific open data requirements
- CERN will establish central support office for compliance







CERN Open Science Policy

- Captures current practice and states progressive vision across multiple Open Science domains:
  - Open Access to Publications
  - Open Research Data
  - Open Software
  - Open Hardware
  - Research Integrity, Reuse & Reproducibility
  - Infrastructure for Open Science
  - Research Assessment & Evaluation
  - Education, Training & Outreach
  - Citizen Science
- Policy to be regularly updated to reflect changes in landscape, practices, funder requirements & community demands
- Policy and its implementation plan are developed and governed by the community.
- V1.0, formally adopted by CERN Council, in force since Oct 2022: https://cds.cern.ch/record/2835057

Open source software

3. Open source software

CERN software is made available as open source wherever possible, applying a licence approved by the Open Source Initiative (OSI). CERN handles its research-related software as an integral part of its research products. Analysis of the CERN experiments' physics data must be possible with open source software. External communities should be invited to use and contribute to the evolution of CERN's software projects. CERN's software expertise should be shared with other science disciplines. Software development processes are expected to follow best practices[4]. CERN contributes to open source software relevant to its mission through code contributions, participation in the evolution of software, and standardisation.

https://cds.cern.ch/record/2835057

Open hardware

4. Open hardware

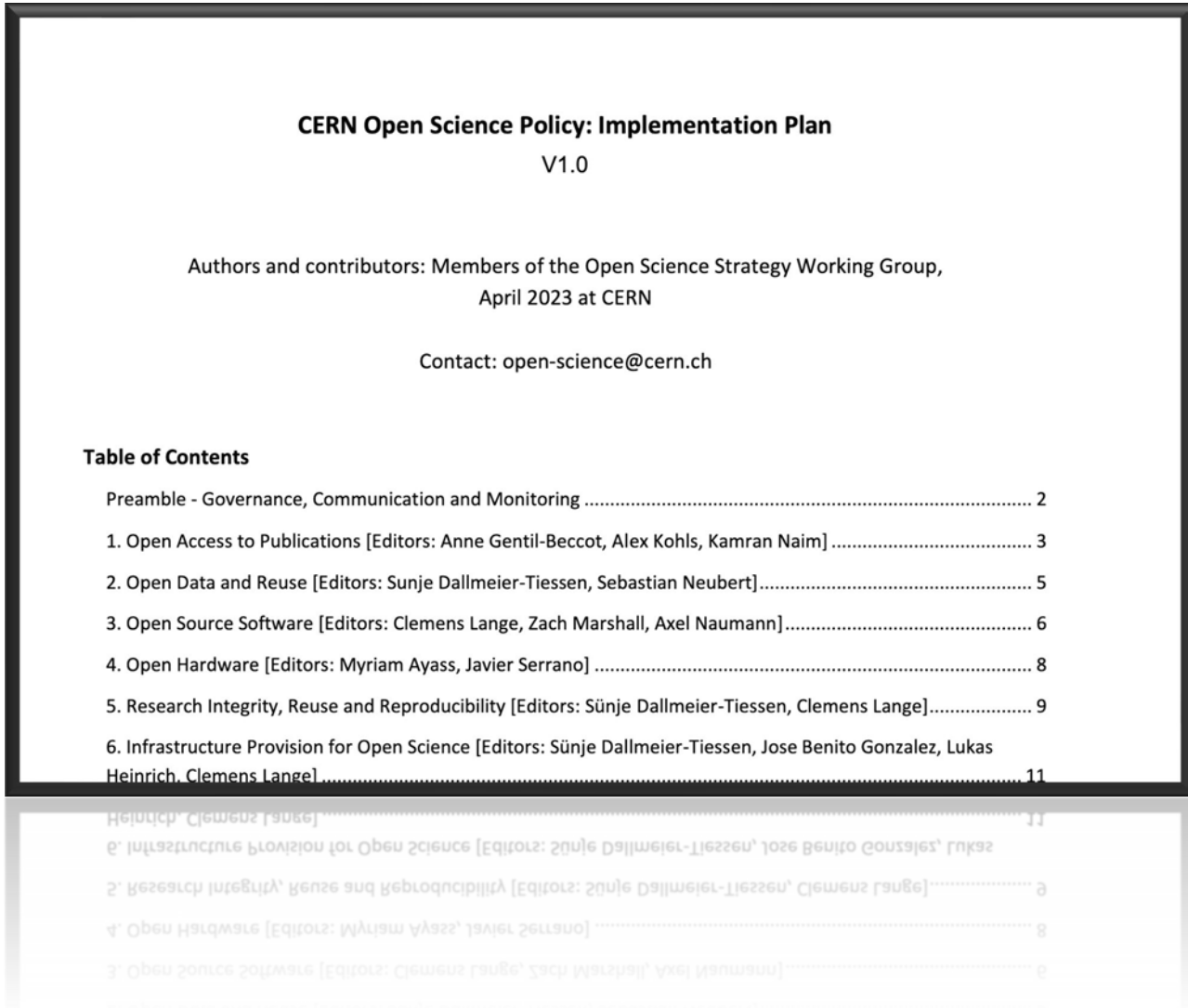
CERN makes its technologies broadly available to society and has introduced open hardware licensing as a key mechanism to achieve this goal. Open hardware designs are made available through the Open Hardware Repository. The legal basis for the sharing of open hardware is enabled through variants of the CERN Open Hardware Licence. Hardware design releases will consider opportunities for collaboration with other research communities and industry. In cases where extensive documentation and ancillary components like software for interfacing and testing are required for projects, these should be licensed under appropriate open source documentation and software licences respectively.

https://cds.cern.ch/record/2835057

Implementation Plan

Approved and published April 2023

Version 1 openly available in our repository:
https://cds.cern.ch/record/2856044



CERN Open Science Policy: Implementation Plan

V1.0

Authors and contributors: Members of the Open Science Strategy Working Group, April 2023 at CERN

Contact: open-science@cern.ch

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3. Open Source Software [Editors: Clemens Lange, Zach Marshall, Axel Naumann] 6

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5. Research Integrity, Reuse and Reproducibility [Editors: Sünje Dallmeier-Tiessen, Clemens Lange] 9

6. Infrastructure Provision for Open Science [Editors: Sünje Dallmeier-Tiessen, Jose Benito Gonzalez, Lukas Heinrich, Clemens Lange] 11

Examples from the implementation plan

Software

[…] Software projects are recommended to consult a future CERN Open S… e (OSPO) and the CERN Knowledge Transfer (KT) group for topics such as licenc…

The KT group at CERN is tasked to make assessments o… pplications, and advises on licensing matters for software with di… ergy physics. The OSPO is in the planning phase. […]

Hardware

[…] Whenever a t… design which could be generally useful beyond the laboratory … nowledge Transfer (KT) group. KT will be able to recommend the best li… n, including through open-sourcing that design under one of the three varia…]

OUTDATED!

Launch of CERN‘s Open Source Program Office (OSPO)

https://indico.cern.ch/event/1327562/


Introduction
Why
Interlude
How
Who
Links and further discussion
CERN | OSPO
OSPO website: https://opensource.cern
Documentation website: https://ospo.docs.cern.ch
OSPO forum: https://ospo.web.cern.ch/
OSPO email address: Open.Source@cern.ch
Join us for more in-depth discussion tomorrow at 14:00 in the Main Auditorium: https://indico.cern.ch/event/1327563/.
CERN OSPO Team
Open Source at CERN: our OSPO
28/28

OSPO = Open Source Program Office

centre of competency for an organisation's open-source operations and structure. This can include setting code use, distribution, selection, auditing and other policies, as well as training developers, ensuring legal compliance and promoting and building community engagement that benefits the organisation strategically

TODO group

What will the OSPO do?

- The OSPO develops and **drives Open Source practices**, **promotes CERN as a contributor** to Open Source development; **asserts CERN as** competent and conscious **user** of Open Source; and **enables CERN's due diligence** related to Open Source.
- The OSPO is an **entry point to CERN's expertise** in Open Source.
- The OSPO is an open and inclusive service, **working internally** across departments with and **for the** entire CERN **community**, and **externally as** a visible **interface** to potential partners and the interested public.
- The OSPO may provide or organise **events, communication, support and training** related to Open Source.

CERN Open Source Program Office: Mandate

Internal Mandate

- Consult, advise, train on Open Source best practices, tools, licenses, etc.
- Advise on open-sourcing CERN software and hardware.
- Catalogue of Open Source software and hardware.
- Identify dependencies and compatibility for critical services.
- Advise CERN on Open Source matters.

External Mandate

- Showcase CERN contributions to e.g. member states' Open Source ecosystems.
- Facilitate partnerships with external entities, e.g. companies.
- Promote CERN as an Open Source lab.

Contact: Open.Source@cern.ch
https://opensource.cern/
Mandate: http://cds.cern.ch/record/2879995

OSPO operating model

- The OSPO is a **cross-departmental** CERN body **operated through its participating departments** or units
- The OSPO **reports to the Open Science Steering Board**
- **Each participating department** or group nominates **one OSPO team member**.
- **Decisions** of the OSPO shall be **taken by consensus**.
- A **yearly OSPO report** monitors the developments and is published openly.
- **Shared responsibility with CERN KT**: all new software disclosures are processed by the OSPO and all new hardware disclosures are processed by KT.

OSPO launch and plans in 2024

Public launch event and community event to start the work (November 2023)
Support the community
Technical documentation a priority in Q1 2024 to support the community
Catalogue of Open Source software and hardware in preparation
Further operationalize our support for inquiries
Understand further training needs
Metrics definition
Membership extension, external stakeholder engagement and reporting

Thank you!

Contact us:
Open.Source@cern.ch
https://opensource.cern/
Mandate: http://cds.cern.ch/record/2879995

Digital OPEN Lab

Als Teilprojekt von OPEN Transfer

GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

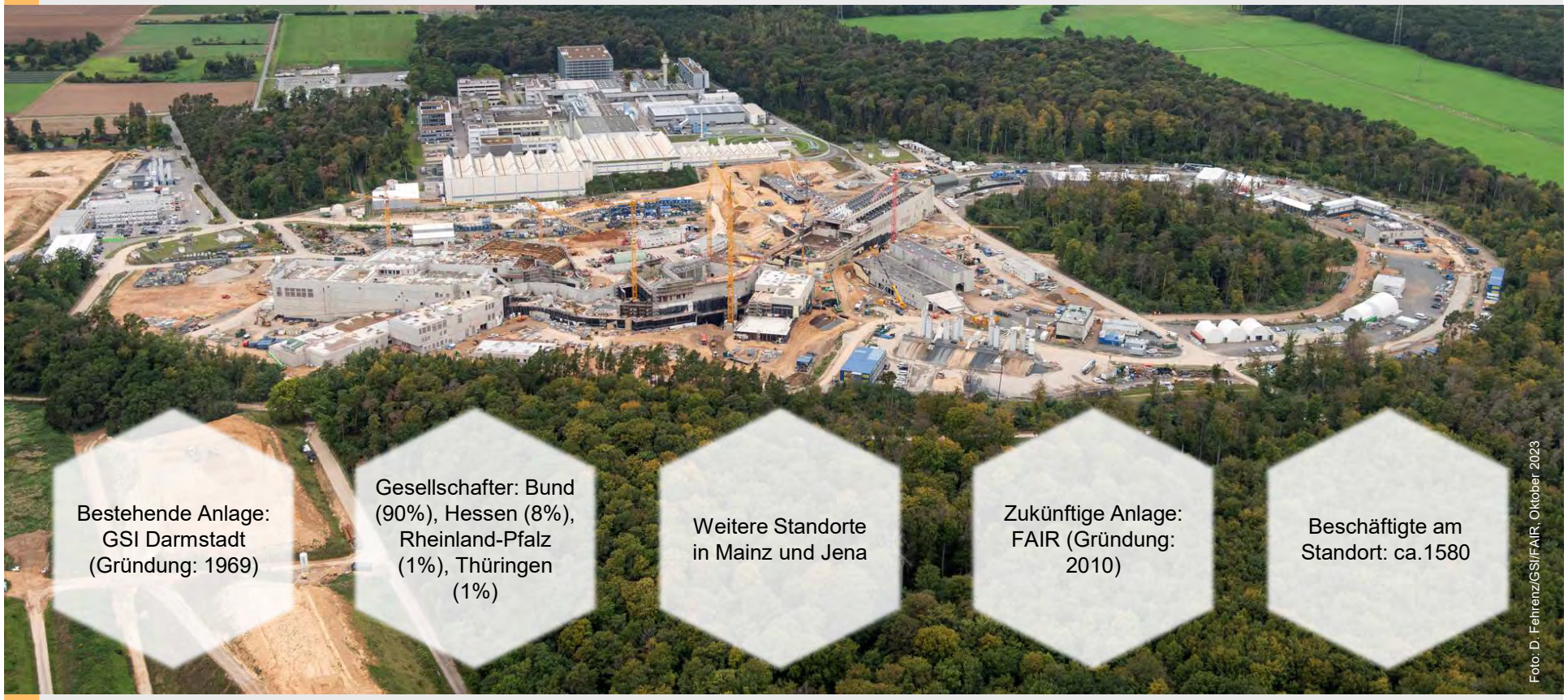
OPEN TRANSFER

Auswirkungen von Open Science Strategien auf die Transferaktivitäten deutscher Forschungseinrichtungen

sowie das laufende Projekt

"OPEN TRANSFER Strategien für den Transfer von Forschungsergebnissen im Open-Science-Kontext"

GSI GmbH – Helmholtzzentrum für Schwerionenforschung
FAIR GmbH – Facility for Antiproton and Ion Research



Wir erforschen das Universum …

… im Labor.

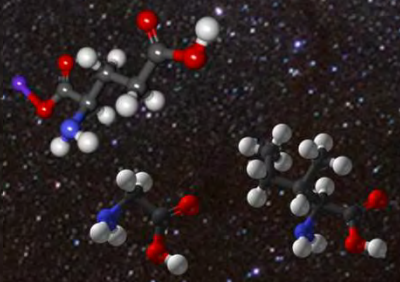
Foto: J. Hosan/GSI/FAIR, "NASA, ESA, the Hubble Heritage Team (STScI/AURA), A. Nota (ESA/STScI), and the Westerlund 2 Science Team"

Um Antworten auf grundlegende Fragen über das Universum zu finden

Wo entstehen die schweren Elemente?

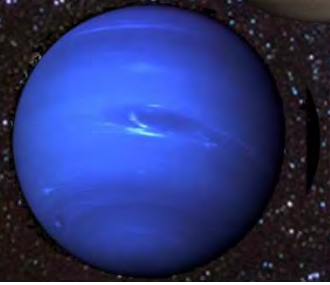
FAIR
GSI

Was befindet sich im Inneren eines Neutronensterns?



Was passiert mit menschlichen Zellen auf dem Weg zum Mars?

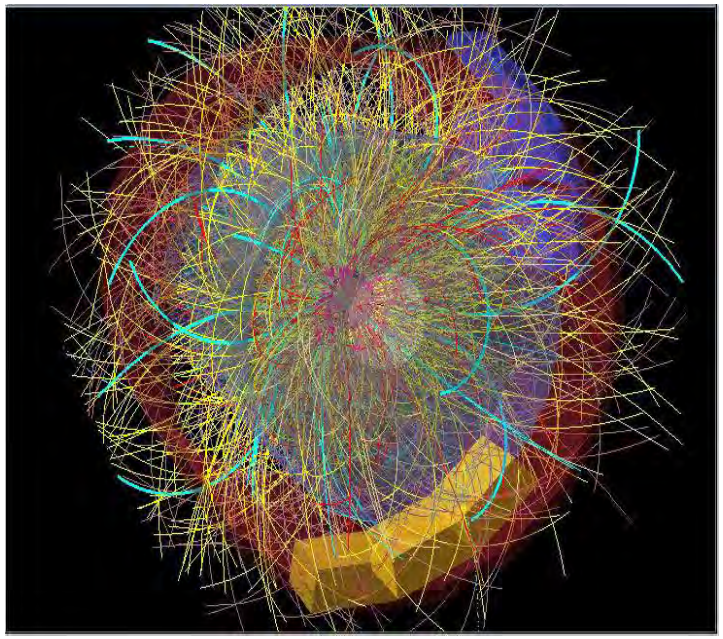
Wie entstehen komplexe Moleküle?



Wie verhalten sich Materialien unter hohem Druck?

Fotos: Uranus, Jupiter, Erde Quelle: http://de.wikipedia.org

Computing bei FAIR: Big Data



Pb-Pb Kollision (ALICE-Detektor) Quelle: CERN

Data Center Green IT-Cube

Hohe Datenraten (Streaming):
> 1 TByte/s in Online Farmen

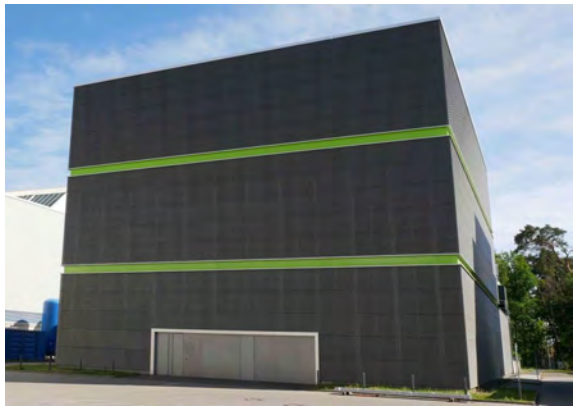
Hohe Datenmengen:
- Online bis zu 250 Pbyte
- bis zu 50 PByte/Jahr auf Platte

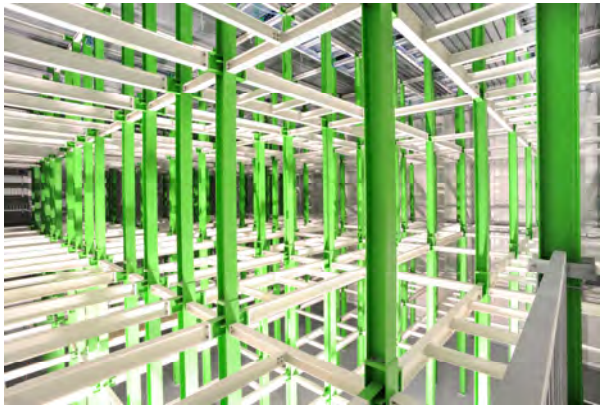
Hohe Computer-Kapazitäten:
~>200.000 Cores

Hohe Vielfalt:
von strukturierten Daten zu Bildern

Hoher Wert:
wissenschaftliche Ergebnisse

Green IT Cube: Energieeffizientes und ressourcenschonendes Rechenzentrum



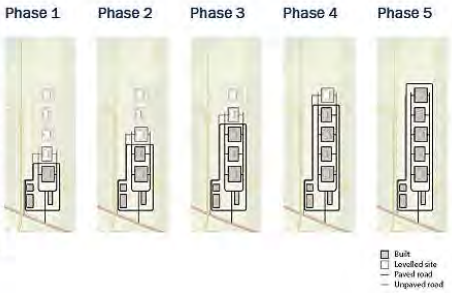


Spezielles Kühlsystem für Energie- und Kosteneffizienz	Der Energieverbrauch ist im Vergleich zu herkömmlichen Rechenzentren um 10 % niedriger	Kühlkapazität von 12 Megawatt (derzeit 4 Megawatt)	Die 3D-Konstruktion spart Platz und ermöglicht kurze Kommunikationswege	100 Petabyte Festplattenspeicher	Umwelt- und Energieeffizienzlabel "Blauer Engel" wurde 2020 verliehen

Erfolgreicher IP- und Knowhow Transfer zum Bau von Cubes in 2019/2020

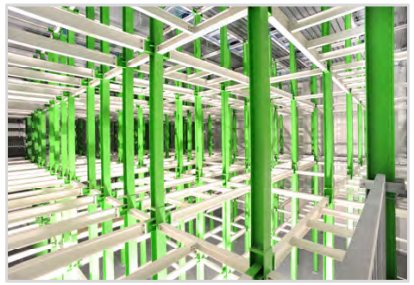
Green Data Centers

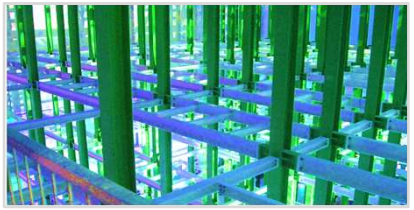
Maximum Agility • Minimum Cost and Risk • Ultra-energy-efficient • Resource-saving

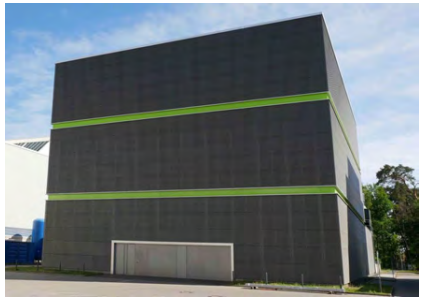


NDC

Green IT Cube (2020)
Idee: Digital OPEN Lab







Status quo

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Floor 6
		Digital Open Lab: *R&D projects with industry*			

FAIR Phase 0 / GSI (2020)

Öffentliche Förderungen

Finanziert von der Europäischen Union
NextGenerationEU

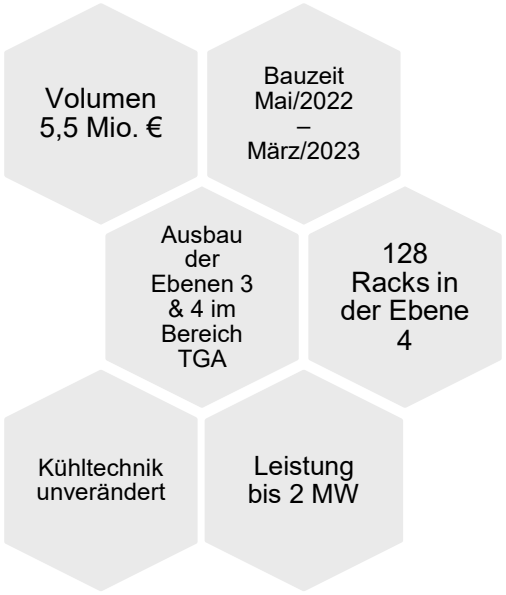
Dieses Projekt wird aus Mitteln des Europäischen Fonds für regionale Entwicklung als Teil der Reaktion der Union auf die COVID-19-Pandemie finanziert.

HESSEN
Hessisches Ministerium für Wissenschaft und Kunst

Open-Innovation- & Co-Innovation-Ansatz zur Zusammenarbeit mit öffentlichen und Industrie-Partnern

Green IT-Cube Ausbaustufe 2

- **Finanzmittel aus dem REACT-EU Programm**



Digital Open Lab
Real-Labor im Green IT-Cube

Gewinner des Datacenter Strategy Awards 2022 im Bereich Innovation

Damit wurde die Strategie von GSI/FAIR zur Nutzung des Green IT Cube als Reallabor zur Entwicklung neuer Ideen und Innovationen in Zusammenarbeit mit Startups, KMU`s und Forschungsinstituten gewürdigt.
Dabei setzt GSI/FAIR auf die Open Innovation Strategie und die Co-Innovation Strategie

Gemeinsame Entwicklung

- Angebot zur Bereitstellung der Infrastruktur und IT-Kompetenzen von GSI und FAIR für die gemeinsame Entwicklung rund um die Themen HPC, Big Data und ultraschnelle Datenerfassung, einschließlich Softwareentwicklungen und Produkte

Kollaborationen

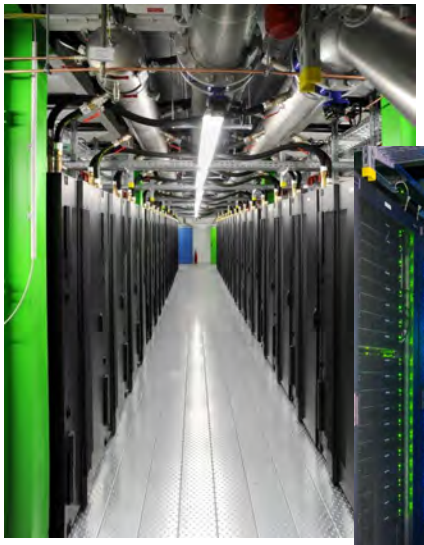
- Zugang zu HPC-Systemen und Projekten für externe Partner über Kooperationsprojekte

Bereitstellung von Rackspace

- Angebot von Dienstleistungen im Rechenzentrum

Infrastruktur für DOL

Modulare Bauweise mit jeweils 2 Ebenen (3 Module)
2 Etagen mit je 128 Racks in 8 Reihen
Nominal 2 MW pro Etage



N + 1 Redundanz in der Kühlung Je 3 Pumpen für

- Primären Kreislauf
- Sekundären Kreislauf
- 3 Wärmetauscher

4 Kühltürme für 2 Ebenen

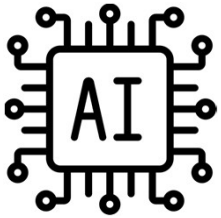
- N+1 Redundanz
- Wassertemperatur 15 – 23 °C (abhängig von der Jahreszeit)

Heizen eines Büro- und Kantinengebäudes

Fotos: G. Otto & Dr. Helmut Kreiser GSI Helmholtzzentrum für Schwerionenforschung

Digital Open Lab
Real-Labor im Green IT-Cube

Das **Digital Open Lab** innerhalb des Green IT-Cube bietet eine ideale Umgebung für die Entwicklung, das Testen und Hochskalieren von **energieeffizientem High-Performance-Computing** auf den Maßstab industrieller Demonstratoren.



Ein solches „Living Lab“ ermöglicht es, unterschiedliche F&E-Möglichkeiten bspw. auch mit **KI-und Cyber-Security Themen** partnerschaftlich insbesondere für die Nutzung durch **KMU und Start-ups** zu nutzen.

Aktuelle Partner vom Digital Open Lab

Einweihung des KI-Innovationslabors
im Rahmen von Digital OPEN Lab.

FAIR GSI

hessian.AI

h_da
HOCHSCHULE DARMSTADT
UNIVERSITY OF APPLIED SCIENCES

NDCGARBE.

UNIVERSITÄT
DES
SAARLANDES

GOETHE
UNIVERSITÄT
FRANKFURT AM MAIN

DC SMARTER

Partner bei The Hessian AICon

-**Frau Stark-Watzinger:**
-Bundesministerin für Bildung und Forschung

-**Frau Prof. Sinemus**:
-Hessische Ministerin für Digitale Strategie und Entwicklung

-**Frau Ayse Asar:**
-Staatssekretärin im Hessischen Ministerium für Wissenschaft und Kunst

Digital Open Lab bildet die Basis des Hessischen KI-Transfer-Ökosystems

EDITH als Teil von DOL

Zur Unterstützung von KMUs und Kommunen wurden 16 EDIH`s in Deutschland gegründet: EDITH

Es gibt 6 verschiedene Formate

Co-funded by the European Union

EDIH European Digital Innovation Hubs Network

Bereitstellung digitaler Technologien für Unternehmen, Bürger und öffentliche Verwaltungen

TechQuartier

House of Digital Transformation

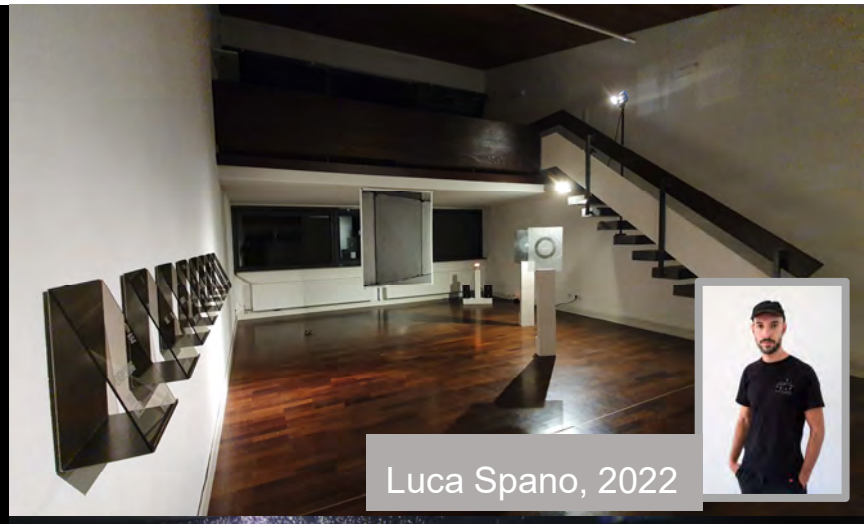
KULTUR EINER DIGITALSTADT

www.kultur-digitalstadt.de

Artist-in-Science-Residence

- Künstlerresidenzen in Kooperation mit renommierten Darmstädter Forschungsinstituten:
  GSI, hessian.AI, ESOC
- Projekte in Kooperation mit den Wissenschaftler:innen und den Technologien
- Umfangreiches Vermittlungs- / Veranstaltungsprogramm
- Gemeinsame Publikation

Kathrin Göbel et al.



KULTUR EINER DIGITALSTADT

www.kultur-digitalstadt.de

Artist-in-Science-Residence @ GSI

- 20 aktive GSIler
- Führungen
- Austausch zu Kunst und Wissenschaft
- Gemeinsame Arbeit an Ausstellungsstücken








Kathrin Göbel et al.

DIGITAL OPEN LAB - Teilnahme am TdoRZ

In Kooperation mit GERMAN DATACENTER ASSOCIATION

Sponsoring von NDCGARBE.

25 Rechenzentrumsbetreiber aus ganz Deutschland

GSI/ FAIR war mit dem Green IT Cube – DOL - dabei!

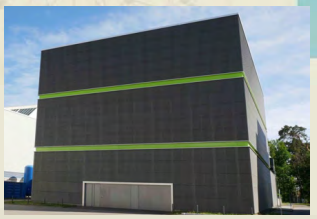
Führungen und Vorträge angeboten inklusive Schulklassen

Nachhaltiges Höchstleistungsrechenzentrum

TdoRZ

TAG DER OFFENEN RECHENZENTREN

29. SEPTEMBER 2023



Wo wohnt eigentlich das Internet?!

www.TdoRZ.de

Neue Transfermethoden durch Förderlinie „Innovationsorientierung in der Forschung“

Entwicklung neuer Strukturen, Prozesse, etc.

„Individuelle“ Verwertungsstrategien

Laterales Führen

Partner finden und überzeugen

Geschäftsprozesse

Vertragsoptionen

Hardware-/ Installationsvoraussetzungen

Projektmanagement

Datenschutz

Business Traffic

Cybersecurity / IT-Sicherheit

Organisationsprozesse

Aufsichtsrat

Regulatorische Barrieren

IP

Kritische Infrastruktur

Geschäftsführung

Vertragsdesign > Vorlagen

Open Transfer

Beihilferecht

Politische Trends

Rechtlicher Rahmen

Geschäftsmodelle

Fachabteilungen

Incentivs für MA.

Einkauf / Ausschreibungen / Beschaffungen

Vergaben

Haftungsausschluss

Networking

Technische Entwicklungen beobachten/begleiten

Neue Transfermethoden durch Förderlinie „Innovationsorientierung in der Forschung“

Erfahrung: Als Transferakteur gibt es….

Mitnehmen

Umschiffen

Steine aus dem Weg räumen

Neue Transfermethoden durch Förderlinie „Innovationsorientierung in der Forschung“

Als Motivationssatz….

„Auch aus Steinen, die einem in den Weg gelegt werden, kann man Schönes bauen.“

– Johann Wolfgang von Goethe.

OPEN Transfer > OPEN Infrastruktur > Digital OPEN Lab

Vielen Dank für Ihre Aufmerksamkeit!

SoftWert

BMBF-Projekt zur Entwicklung eines Methodenbaukastens zur Verwertung von Forschungssoftware

Helmholtz Open Science Forum “Open Science und Transfer“

Zahra Saleh, Dr. Janine Fischer, Lisa Wenzel

Online-Präsentation, 22.01.2024

DESY. GFZ Helmholtz-Zentrum Potsdam DZNE UNIVERSITÄT DES SAARLANDES aTRineo Technologies Minds Markets

SoftWert

Entwicklung und Implementierung eines Methodenbaukastens zur Verwertung von Forschungssoftware

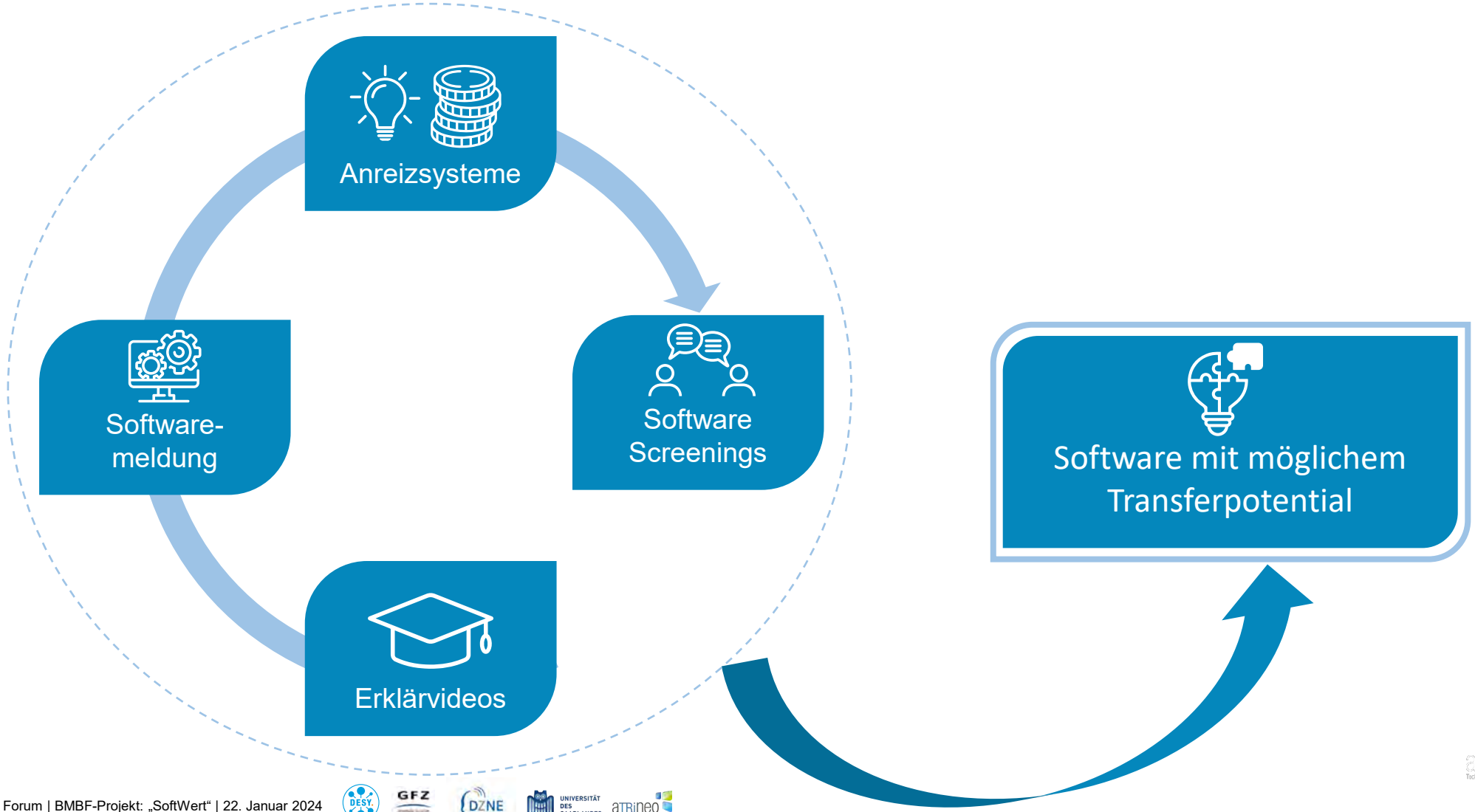
PROJEKTPARTNER

DESY. | GFZ Helmholtz-Zentrum Potsdam | DZNE | Universität des Saarlandes

- **Forschungssoftware = wertvolle Ressource**
- Bedarf an **Good Practices für Transfer**
- **Der Methodenbaukasten**:
  Lösungsansätze und Tools für **Softwareverwertung**

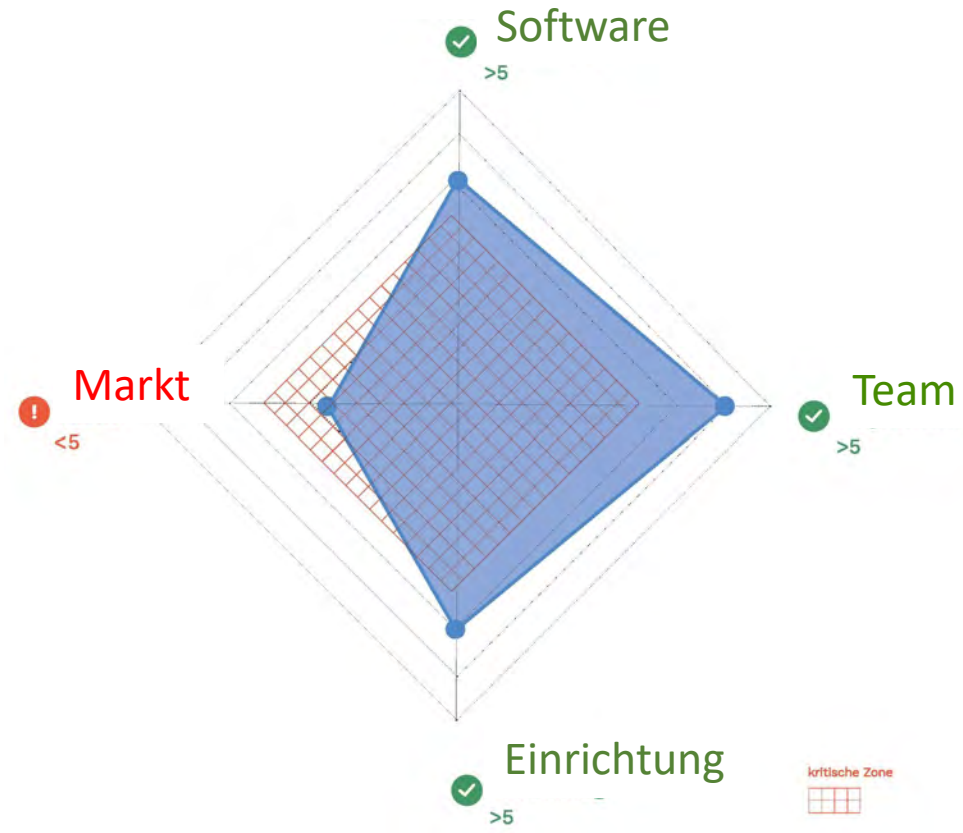
Der Methodenbaukasten

Sensibilisierung & Erfassung von Forschungssoftware



Bewertung des Verwertungspotentials

Das Bewertungstool



Handlungsempfehlungen

Entscheidungshilfe für Transferwege

Entscheidungsbaum
(basierend auf technischen und rechtlichen Restriktionen)

- **Kommerzielle Verwertung**
- **Open Source Veröffentlichung**
- **Service, Dienstleistungen**

Lizenzguide

Apache | GPL | AGPL | EUPL

Rechtliche Fragestellungen

Open Science & Transfer schließt sich nicht aus!

Dual Licensing

Eröffnet die Möglichkeit, Einnahmen aus kommerzieller Nutzung zu generieren, während die Forschungscommunity von der Open Source Version profitiert. Beides fördert die Verbreitung und den Einfluss der Software und kann den Konflikt Open vs. Closed Source auflösen.

Services

Wenn Software nicht an Nutzer weitergegeben wird, sondern darauf aufbauend Services angeboten werden, z.B. auf Basis einer Open Source Software oder durch weiterführende Dienstleistungen im Zusammenhang mit einer Software, ist dies eine zusätzliche Möglichkeit Forschungssoftware zu verwerten.

Wissenstransfer

Die Zugänglichmachung von Forschungssoftware durch OS Lizenz schafft einen signifikanten Impact im Sinne des Wissenstransfers (Aufbaus einer Community, Nachhaltige Softwareentwicklung, Weiterbildung)

Geschäftsentwicklung

Zielsetzung

Kommerzielle Verwertung

Standardisierbarkeit der Software?

Wirtschaftliches Potential der Verwertungsoptionen?

Zusatznutzen durch Open Source?

Ressourcen für Weiterentwicklung?

Features vs. Zusatzservices vs. Aufbau SaaS

Optionen

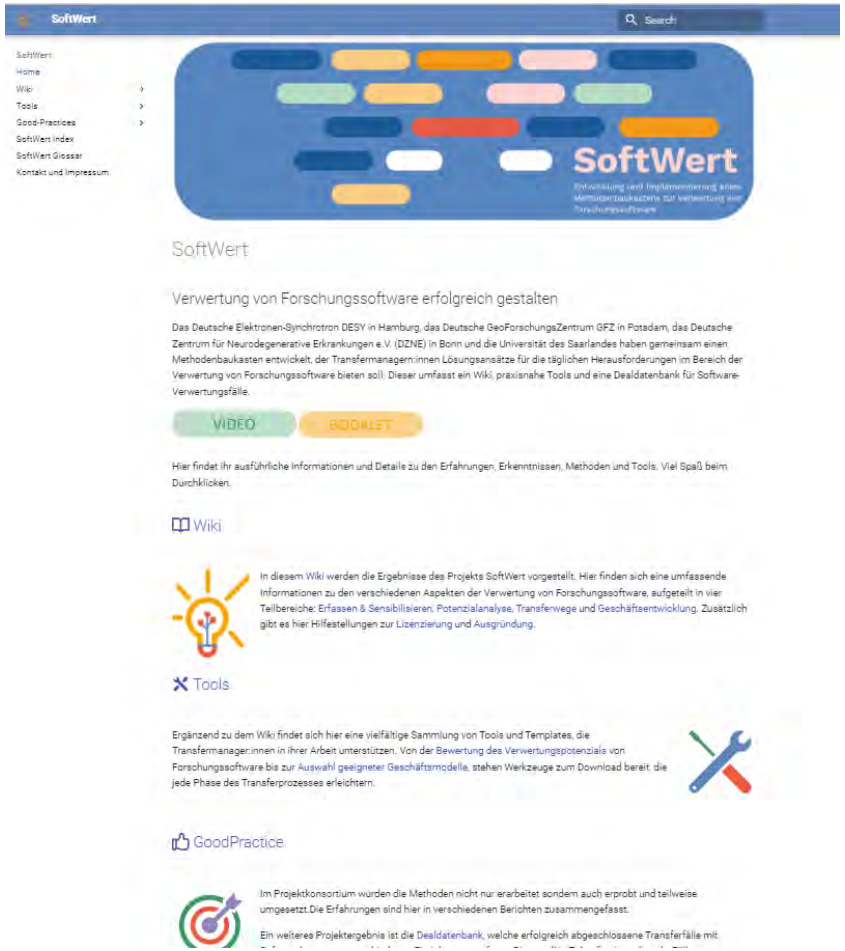
- Lizenzierung
- Dienstleistungen
- SaaS

Umsetzung

Geschäftsmodell-entwicklung

Weiterführende Informationen

Booklet



Wiki

softwert.org

VIELEN DANK FÜR IHRE AUFMERKSAMKEIT!

HELMHOLTZ
Citizen Science

HELMHOLTZ
Open Science

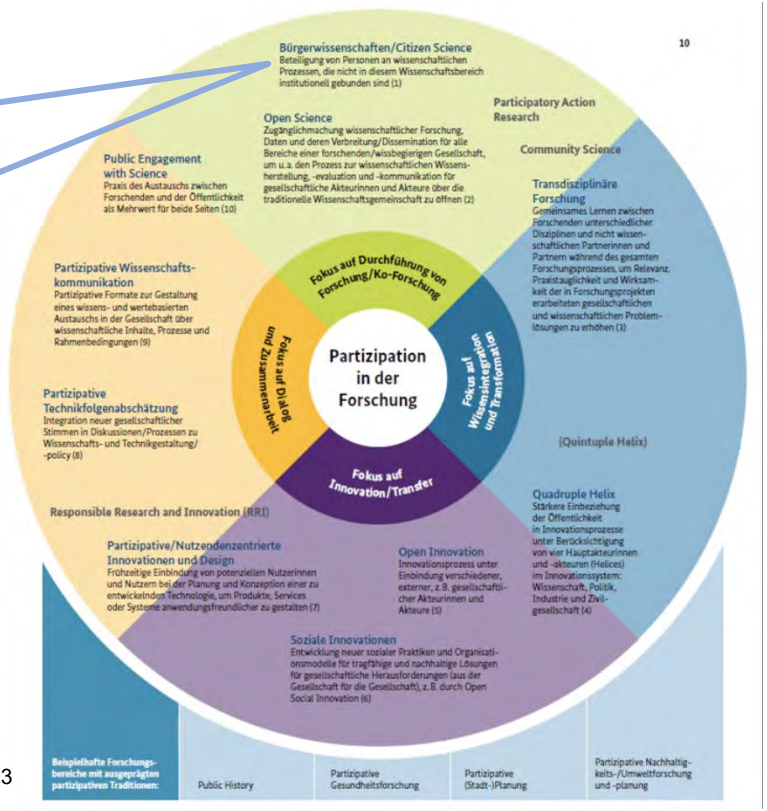
Citizen Science and Participation @Helmholtz
Cooperation Across Research Fields (CARF)

Christin Liedtke (Helmholtz Gemeinschaft) &
Julia von Gönner (UFZ)

22.01.2024

Was verstehen wir unter Citizen Science?

Bürgerwissenschaften (Citizen Science)
Beteiligung von Personen an wissenschaftlichen Prozessen, die nicht in diesem Wissenschaftsbereich institutionell gebunden sind (Bonn et al. 2022)



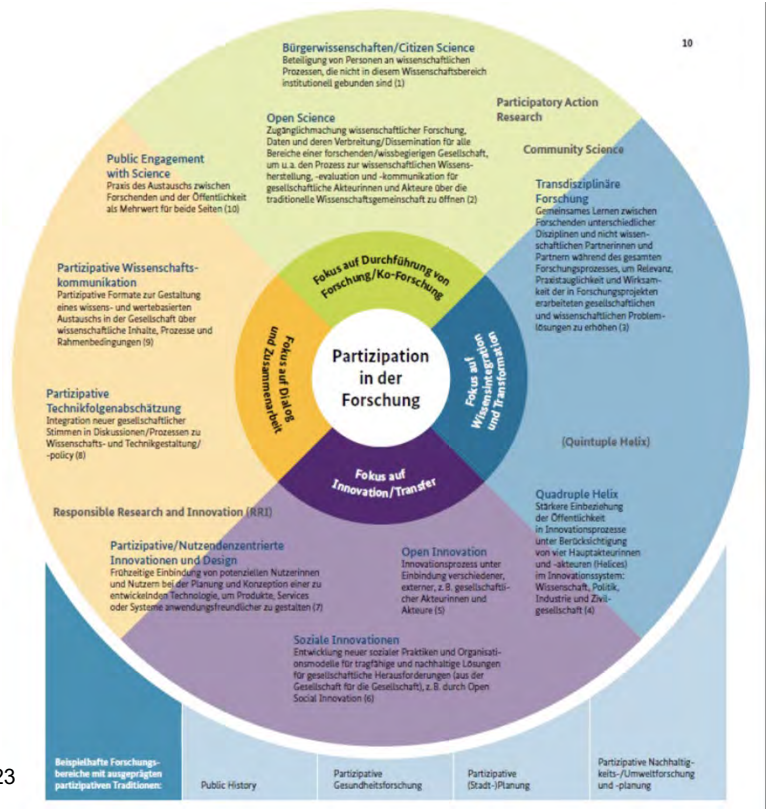
Aus: Partizipationsstrategie BMBF 2023

HELMHOLTZ
Citizen Science

HELMHOLTZ
Open Science

Bearbeitung sozial-ökologischer Krisen erfordert Kooperation zwischen Bürger:innen und Forschenden,
zwischen Zivilgesellschaft und Wissenschaft, um…

- Transparenz und gesellschaftliche Relevanz von Forschung zu verbessern
- Wissenschaftskompetenz und Vertrauen in die Wissenschaft zu fördern
- Gemeinsam transformative Lösungen zu erforschen und umzusetzen
- Kollektive Wirksamkeit für nachhaltige Transformation zu entwickeln



Aus: Partizipationsstrategie BMBF 2023

„Wir werden mit Citizen Science und Bürgerwissenschaften Perspektiven aus der Zivilgesellschaft stärker in die Forschung einbeziehen.“

Koalitionsvertrag SPD, Bündnis90/Grünen, FDP 2021, S. 24

Meilensteine

- Veröffentlichung des CS Weißbuchs Strategie 2030 für Deutschland im April 2022
- Launch der BMBF Partizipationsstrategie im Juni 2023

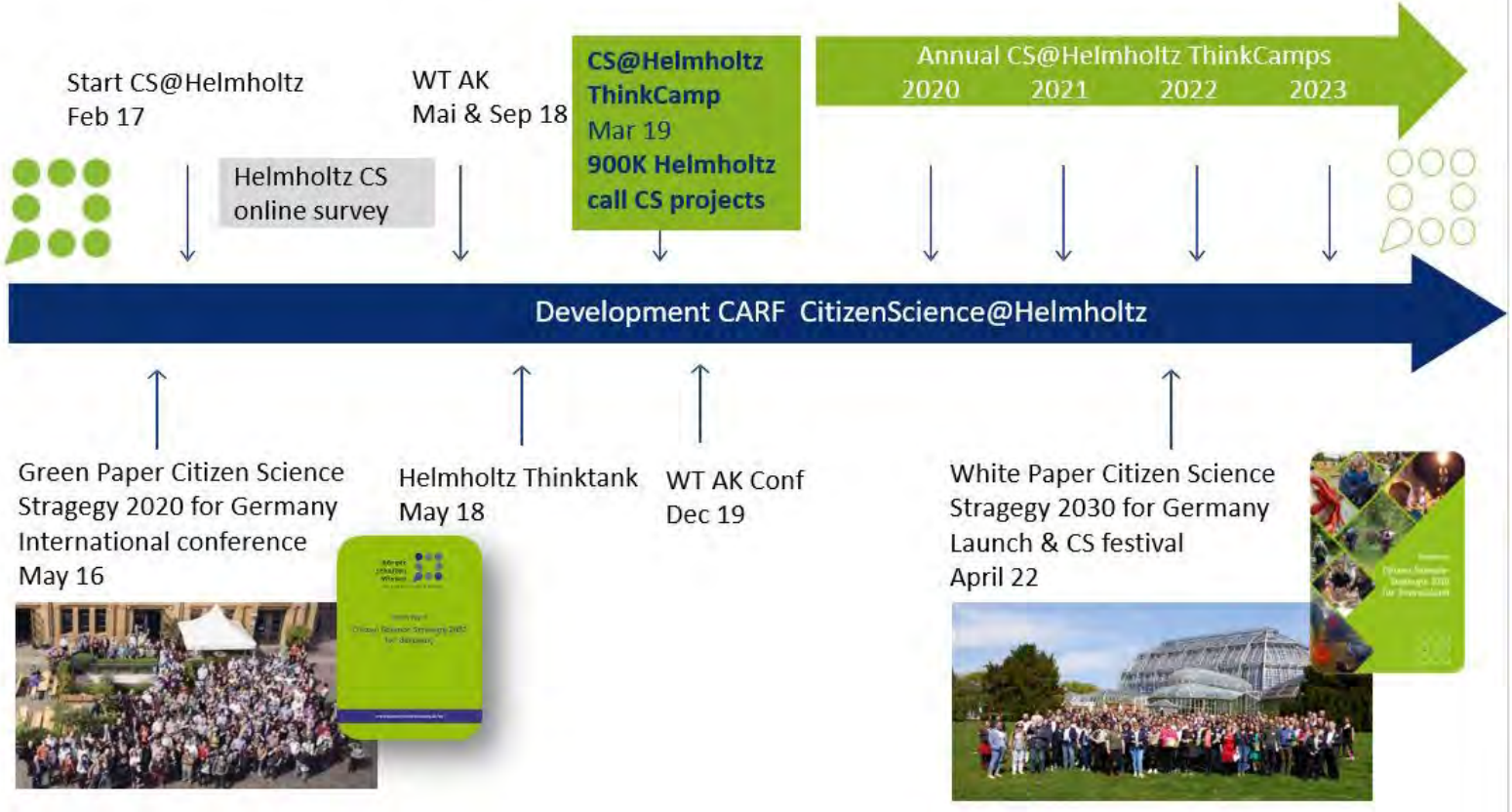
SCAN ME

CS-Weißbuch

Partizipationsstrategie Forschung

Bundesministerium für Bildung und Forschung

Citizen Science Meilensteine in Helmholtz



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Citizen Science

Weißbuch
Citizen-Science-Strategie 2030 für Deutschland

Ziele:

- Ermittlung von Status quo und Herausforderungen aus Sicht der CS Community
- Strategieentwicklung, um CS Potenziale für Wissenschaft, Gesellschaft und Politik weiter auszuschöpfen

- zweijähriger **kollaborativer Stakeholder-Prozess** mit über 200 Beiträgen von 136 Organisationen
- 14 öffentliche **Dialogveranstaltungen und Workshops**

- **Indikatoren und Handlungsempfehlungen für 15 CS-Themenbereiche**, z. B. Datenqualität, Vernetzung, Community-Management, Ethik, Integration in die Entscheidungsfindung

- Umfrage-Ergebnisse: von Gönner et al. 2023, *Socio-Ecological Practice Research*

Zielgruppen der CS Weißbuch Handlungsempfehlungen.

- Citizen Science in Helmholtz bereits sehr erfolgreich (Umwelt & Gesundheit)
- Partizipation: Datenaufnahme >>> Ko-Kreation aller Phasen des Forschungsprozesses

Projektdesign & Datenqualität

Community Management

Wissenschaftliche Wirkung

Gesellschaftspolitische Wirkung

tagfalter-monitoring.de

flow
Fließgewässer erforschen – gemeinsam Wissen schaffen

UNDER COVER EISAGENTEN

cityCLIM

IGAMon-Dog

Pflanze KlimaKultur!

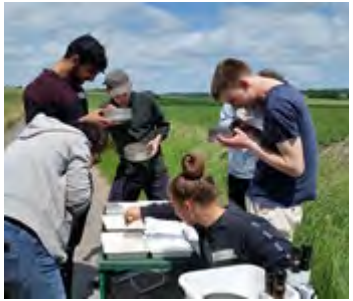
UMWELT TRACKER

HELMHOLTZ
Citizen Science

FLOW Fließgewässermonitoring

www.flow-projekt.de

Messkampagnen 2021-2023



- Geschulte Bürger:innen bewerten Zustand von Bächen (Gewässer-struktur, Wasserqualität, Makrozoo-benthos, Pestizidbelastung)
- Monitoring nach EG-Wasser-rahmenrichtlinie, WebApp
- Datenqualitätskontrolle

- 2021-2023 > 90 Freiwilligengruppen mit über 900 Teilnehmenden
- 137 Bäche beprobt, davon ca. 60% in schlechtem Zustand

- Kooperation UFZ/iDiv, BUND Geschäftsstelle
- Förderung durch BMBF 2021-2023

von Gönner et al. *in review*

https://Nachtlicht-BueHNE.de

C. Kyba, L. Jongejans, T. Surber, S. Truckenbrodt & F. Klan

Ziel 2: Ko-kreative Entwicklung und Datenerhebung mit einer App zum Zählen von **Nachtlichtern**

2019-2021
Entwicklung der Nachtlichter-App mit Bürger:innen

2021
Veröffentlichung und Start der Datenerhebung mit der Nachtlichter-App

2021-2022
>250.000 gezählte Lichter von >200 Bürger:innen

+ seit 11/2022
Fortführung des Projektes im Rahmen des Wissenschaftsjahres 2023
Budget: 353.000 € für Nachtlicht-BüHNE

Eine Initiative des Bundesministeriums für Bildung und Forschung

Wissenschaftsjahr 2023

unser UNIVERSUM

https://Nachtlicht-BueHNE.de

C. Kyba, L. Jongejans, T. Surber, S. Truckenbrodt & F. Klan

Ziel 2: Ko-kreative Entwicklung und Datenerhebung mit einer App zum Zählen von **Nachtlichtern**

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+ seit 11/2022
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Budget: 353.000 € für Nachtlicht-BüHNE

Kyba et al. 2023, *Science*:
Citizen scientists report global rapid reductions in the visibility of stars from 2011 to 2022

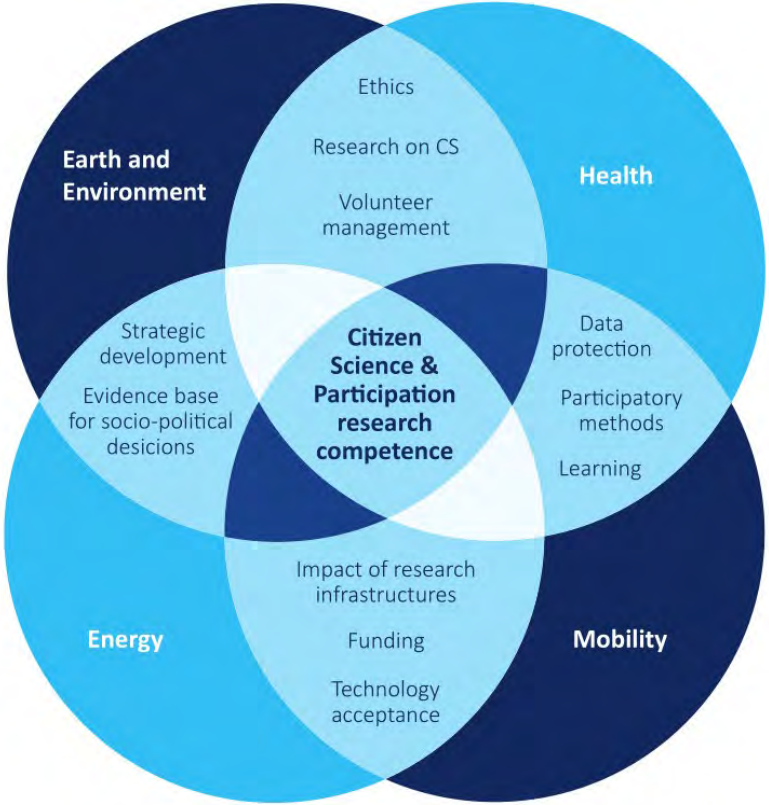
Wissen der Vielen
Forschungspreis für Citizen Science

HELMHOLTZ
Citizen Science

Citizen Science and Participation@Helmholtz Cooperation Across Research Fields (CARF)

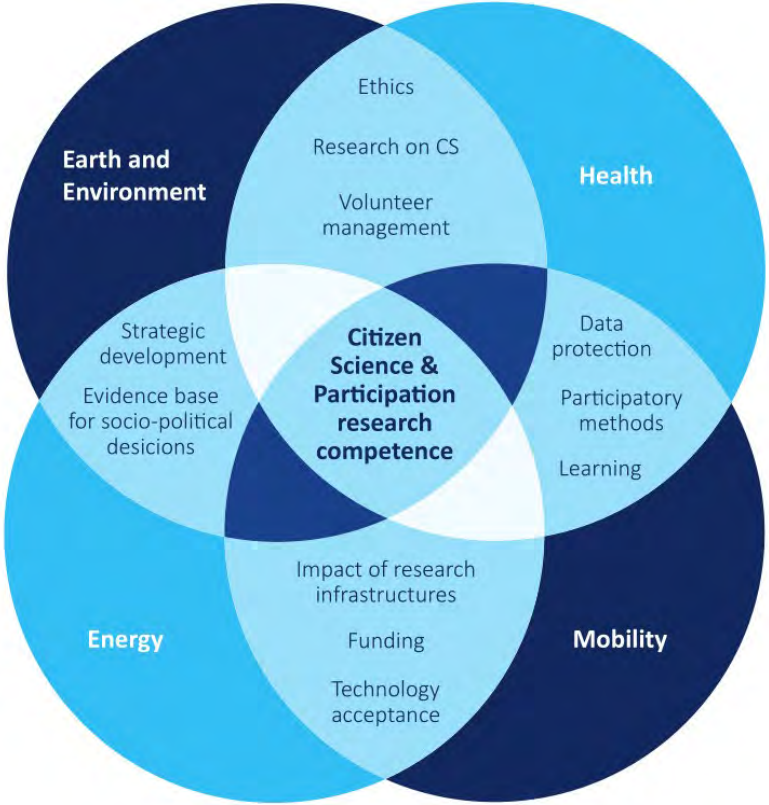
HELMHOLTZ
Open Science

- Themenübergreifende Forschungskooperationen zur Stärkung der CS-Kompetenzen & Synergien @Helmholtz
- Strategische Positionierung & Innovation im Bereich Citizen Science
- Citizen Science Qualitätsstandards, Methodik & Indikatorik
  - Wissenschaftliche Exzellenz
  - Gesellschaftliche Wirkung
  - Aktionsplan zur CS-Whitepaper-Strategie



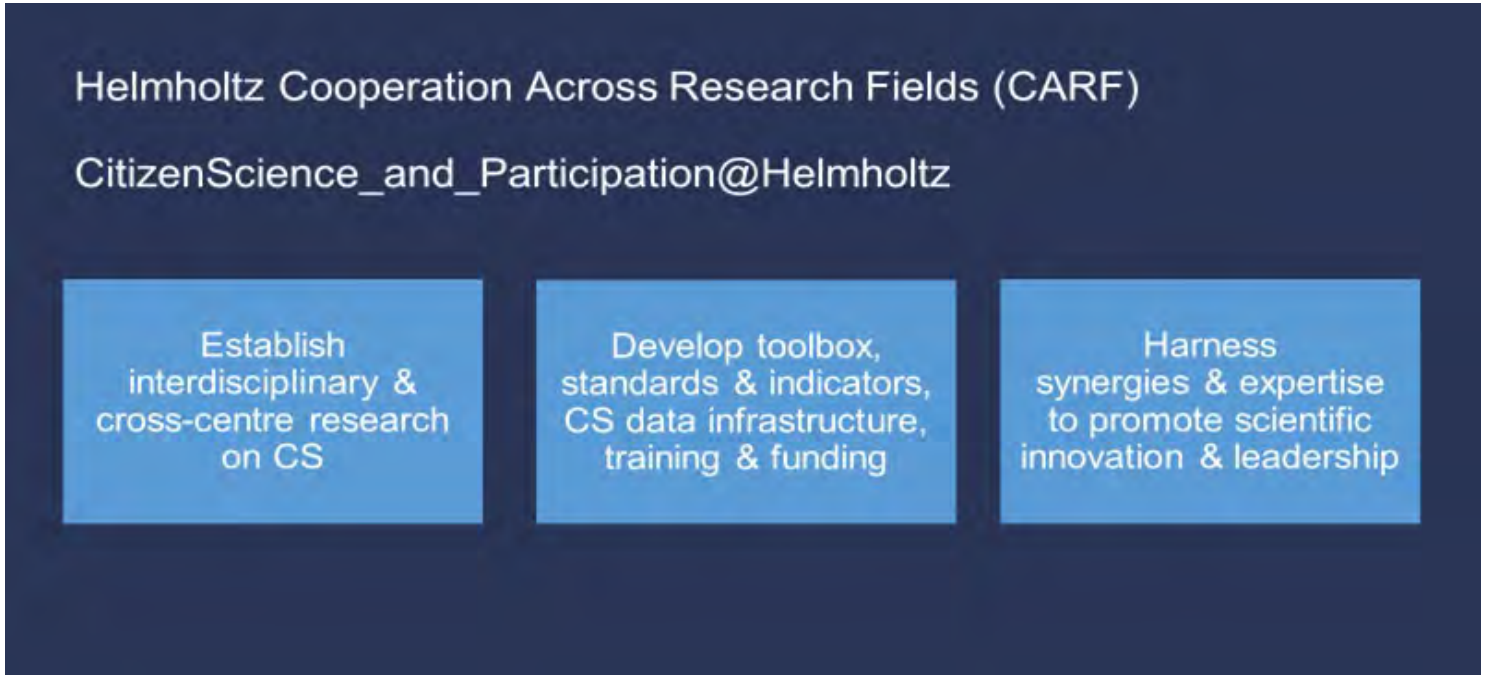
Citizen Science and Participation@Helmholtz Cooperation Across Research Fields (CARF)

- CARF-Antrag wurde vom Programmboard angenommen, wird in der nächsten POF verankert
- Mitarbeit und Unterstützung von allen interessierten Helmholtz-Zentren willkommen



Citizen Science and Participation @Helmholtz
Cooperation Across Research Fields (CARF)

Alles auf deutsch



CS CARF aims and possible activities – results of ThinkCamp 2021

Cooperation between projects and centres

- encourage synergies instead of concurrence between projects
- harness efforts to improve visibility of CS at Helmholtz (e.g. website, events, outreach office)
- create online platform of existing CS tools, apps, learning material, surveys, best practices
- develop shared evaluation criteria (e.g. scientific output AND social impact indicator)

Progress in CS data management

- link CS projects to data infrastructures such as NFDI4Biodiversity
- provide template for CS data management plan
- central ticket system for advice on legal/ethical issues
- joint GitLab for software development?

Participation & training

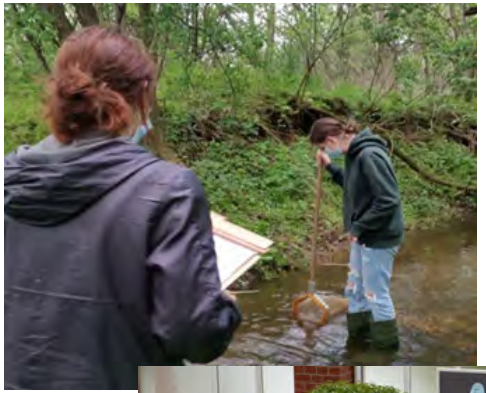
- develop collaborative & co-creative research methods
- offer cross-centre training for researchers on volunteer management/ project communication
- offer training on CS for school teachers
- establish platform for citizens to submit their own research questions

Socio-political impact

- strengthen link of CS projects to urgent socio-political topics
- promote contact with decision-makers and alignment to official monitoring standards

Diskussionsfragen:

- Welche Kompetenzen & Infrastrukturen sind bereits in den Zentren vorhanden, die zur CARF Citizen Science in Helmholtz beitragen können?
- Welche Ressourcen und Tools werden zur gemeinsamen Stärkung von Citizen Science benötigt (Toolbox)?
- Wie könnten diese Ressourcen & Tools zukünftig zur Verfügung gestellt bzw. erarbeitet werden?
- Wie können Standards und Indikatoren für wissenschaftliche Exzellenz und gesellschaftliche Wirkung durch Citizen Science in Helmholtz entwickelt werden?
- …



HELMHOLTZ
Citizen Science

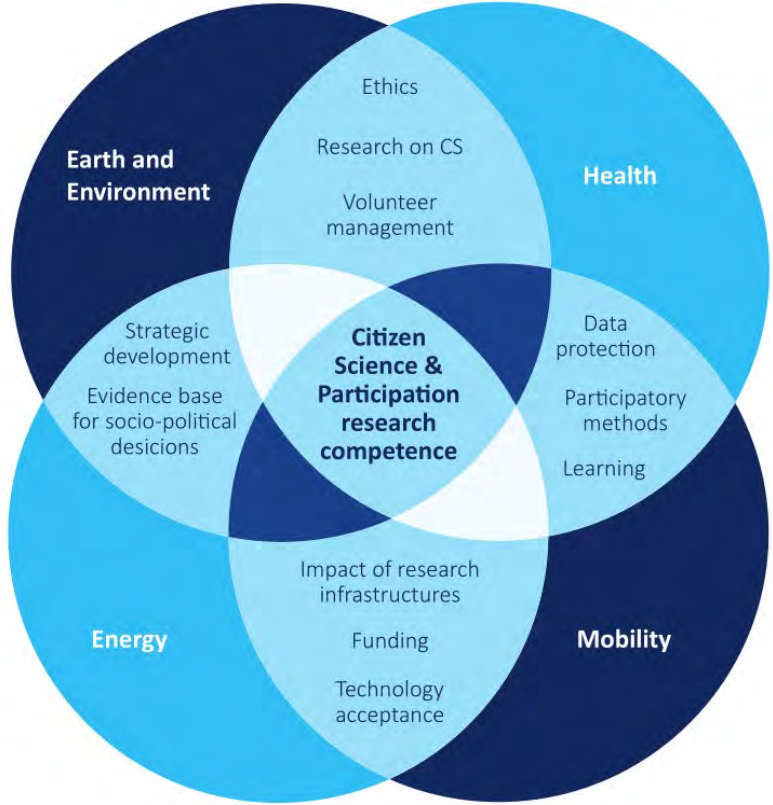
Citizen Science and Participation @Helmholtz Cooperation Across Research Fields (CARF)

HELMHOLTZ
Open Science

Kontakt

- Christin.Liedtke@helmholtz.de
- Julia.Goenner@ufz.de
- Aletta.Bonn@ufz.de

Übersicht der Citizen Science-Projekte bei Helmholtz



HELMHOLTZ
Citizen Science

HELMHOLTZ
Open Science

Vielen Dank für Ihre Aufmerksamkeit!

Wir freuen uns auf Ihre Fragen und Ideen!

22.01.2024 - Citizen Science und Partizipation @Helmholtz

Christin Liedtke (Helmholtz Geschäftsstelle) & Julia von Gönner (UFZ)

Open Transfer

GSI

Leibniz ipht LEIBNIZ-INSTITUT für PHOTONISCHE TECHNOLOGIEN

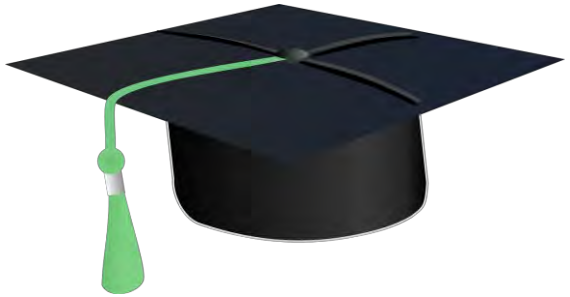
HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

Presenter: Dr. Vladimir Voroshnin

Open Science and Transfer Icebreaker: Open Toolbox for Technology Transfer; Reasons, Goals & Strategy

Published at zenodo.org/communities/opentransfer

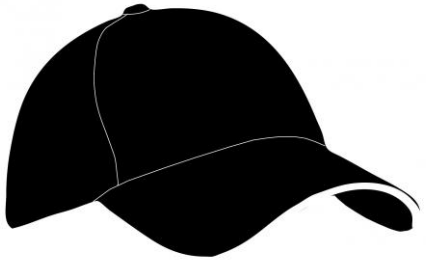
Presenter: different hats



Researcher & Open Data advocate

Technology Transfer

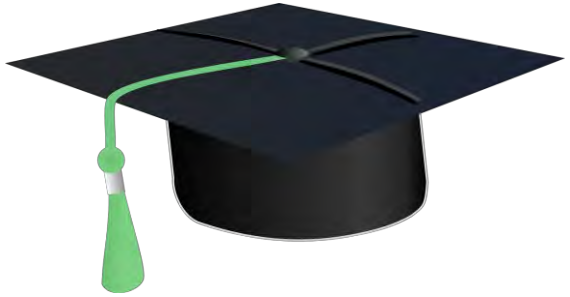
Open Transfer



Hardware developer

Spin-off Founder

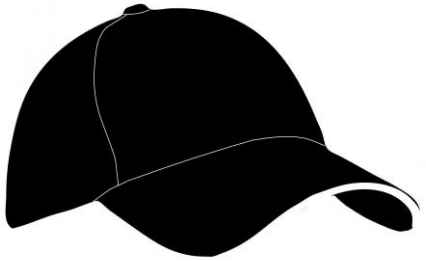
Presenter: different hats



Synergy and social impact of collaborative work

To bult value around academic results (increase the impact)

Open Transfer



- **Parts to build from**
- **feel useful**
- **be recognized**

Self-sustainable, independent & profitable

What is OPEN?

Open = Open to Access (Publications)

Open = Free to Utilize

- Text (Materials, code, DATA …)
- Inventions (Ideas, methods, …)

Open = Free to Use (Free Service)

Open = Open for Costumers (Open Lab)

Open = Transparent & Findable

Open = Open License (Open Source)

Lets not be foggy…

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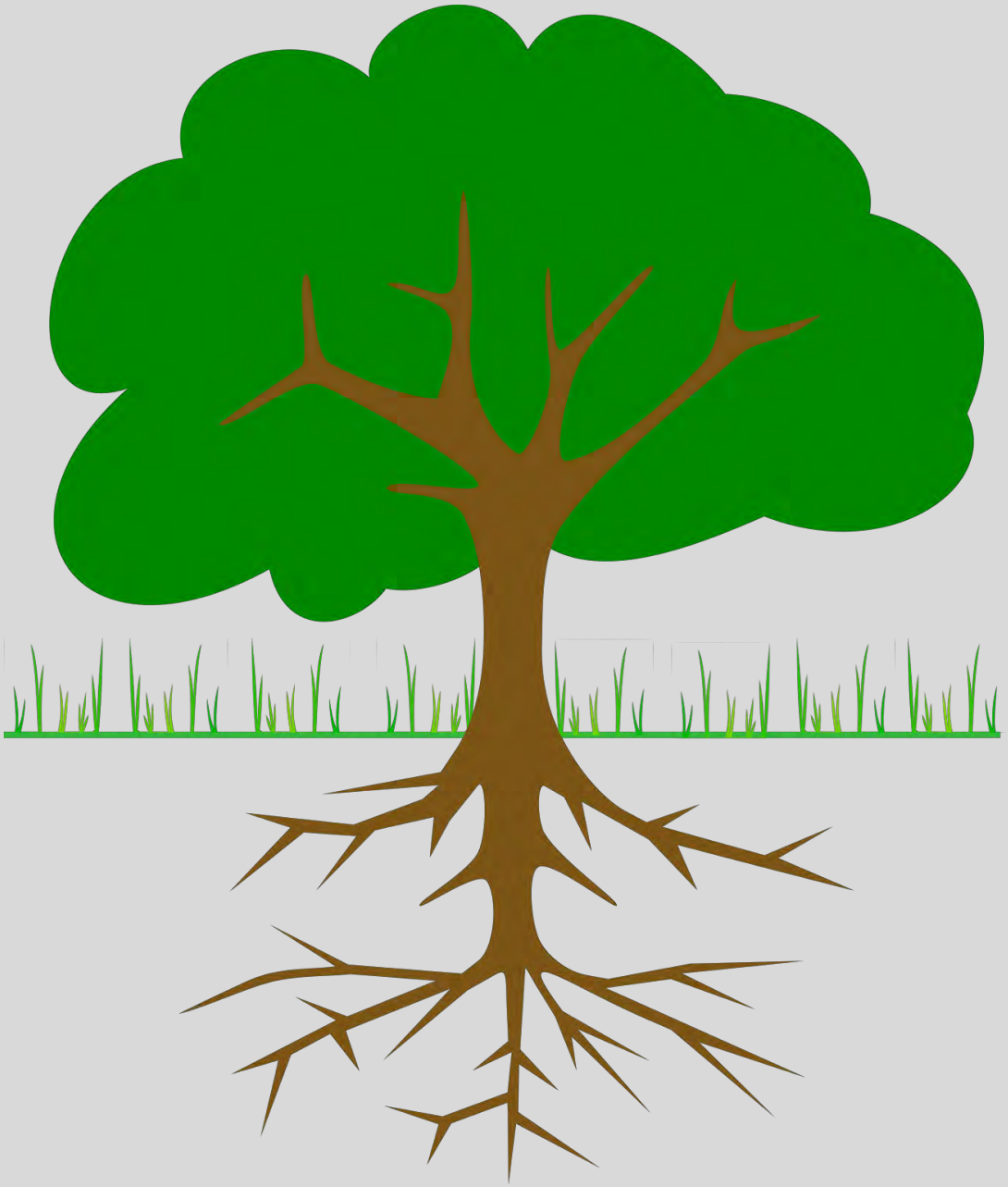
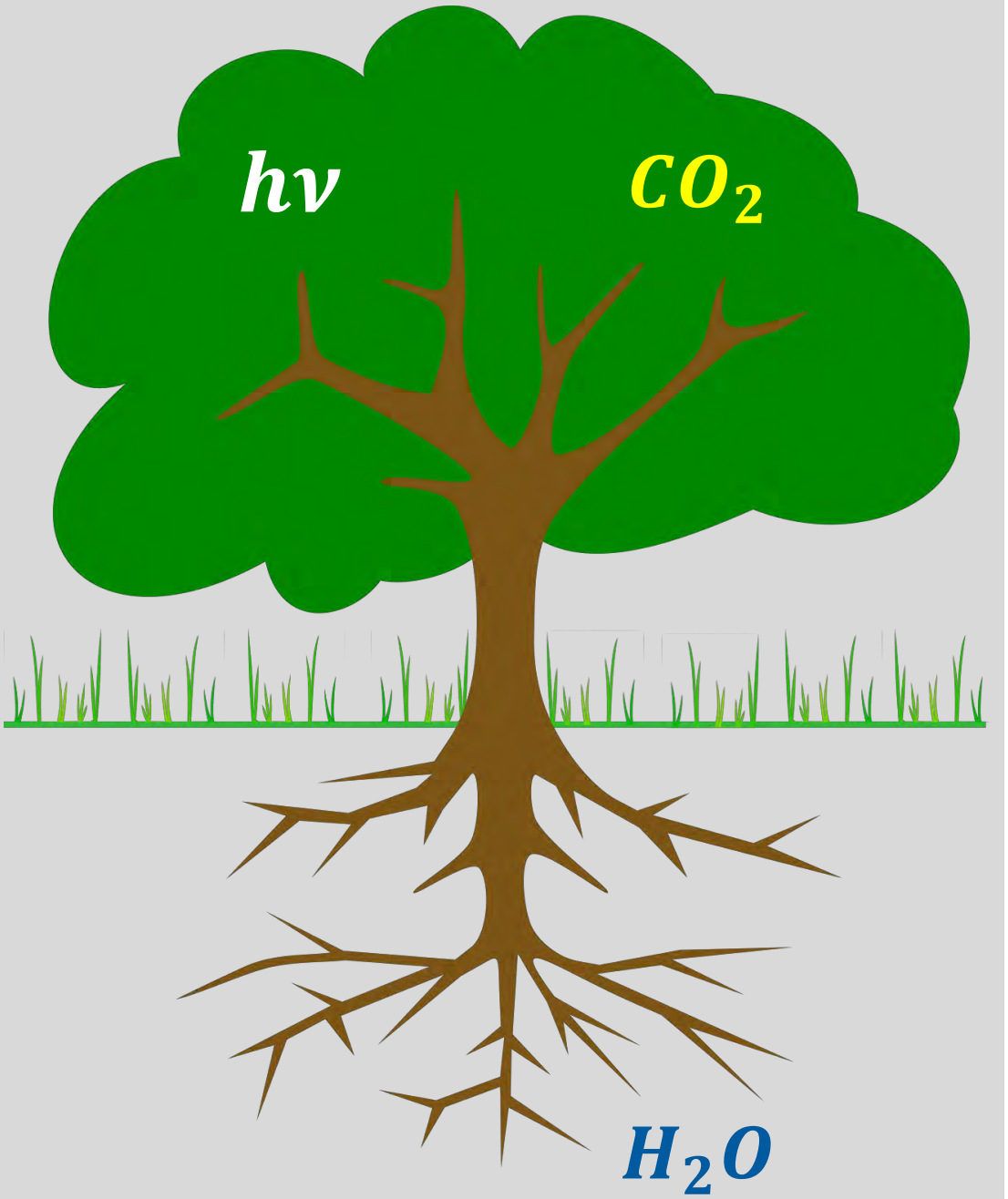
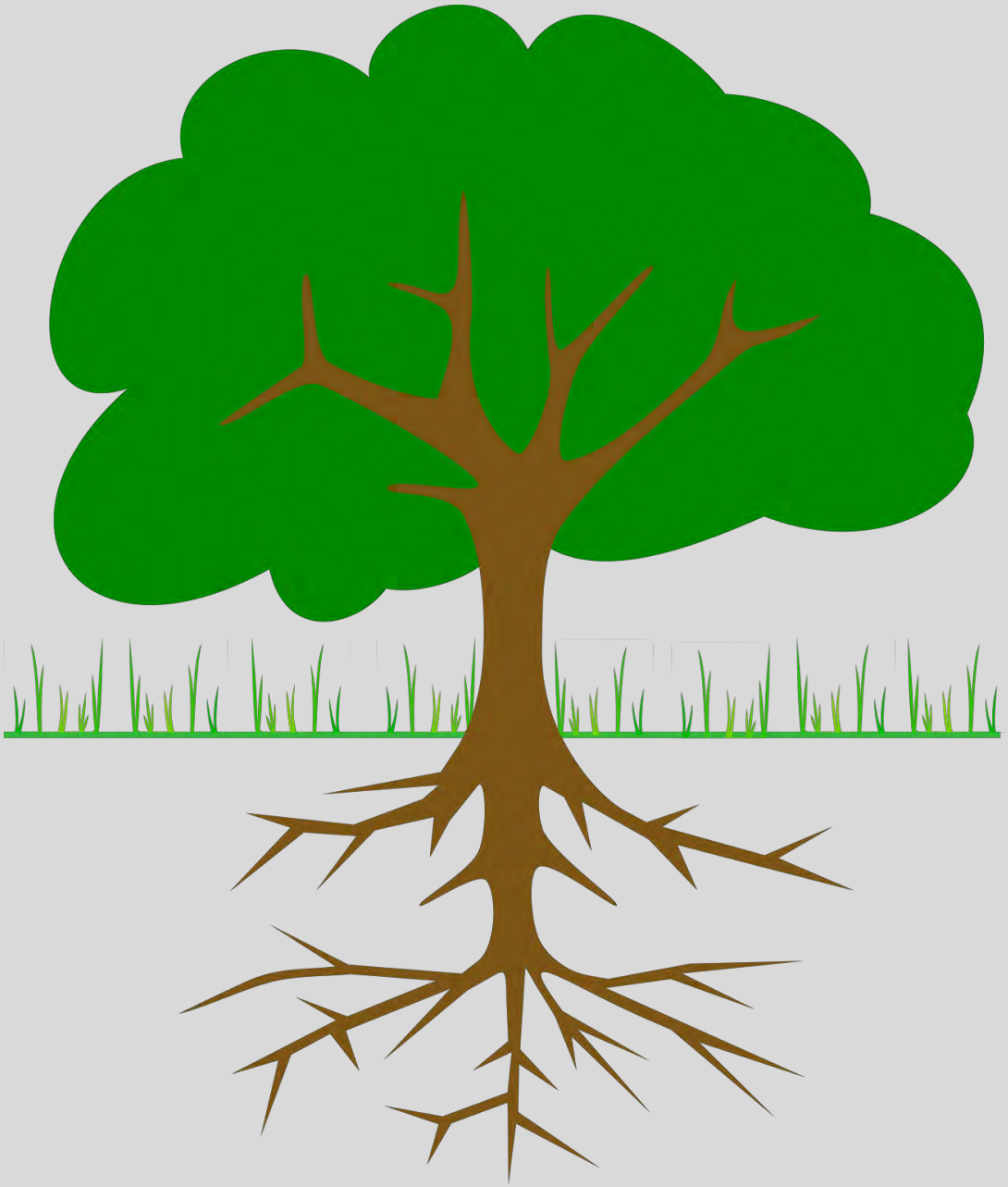
Whatever make a value

for someone




$h\nu$
CO_2
H_2O

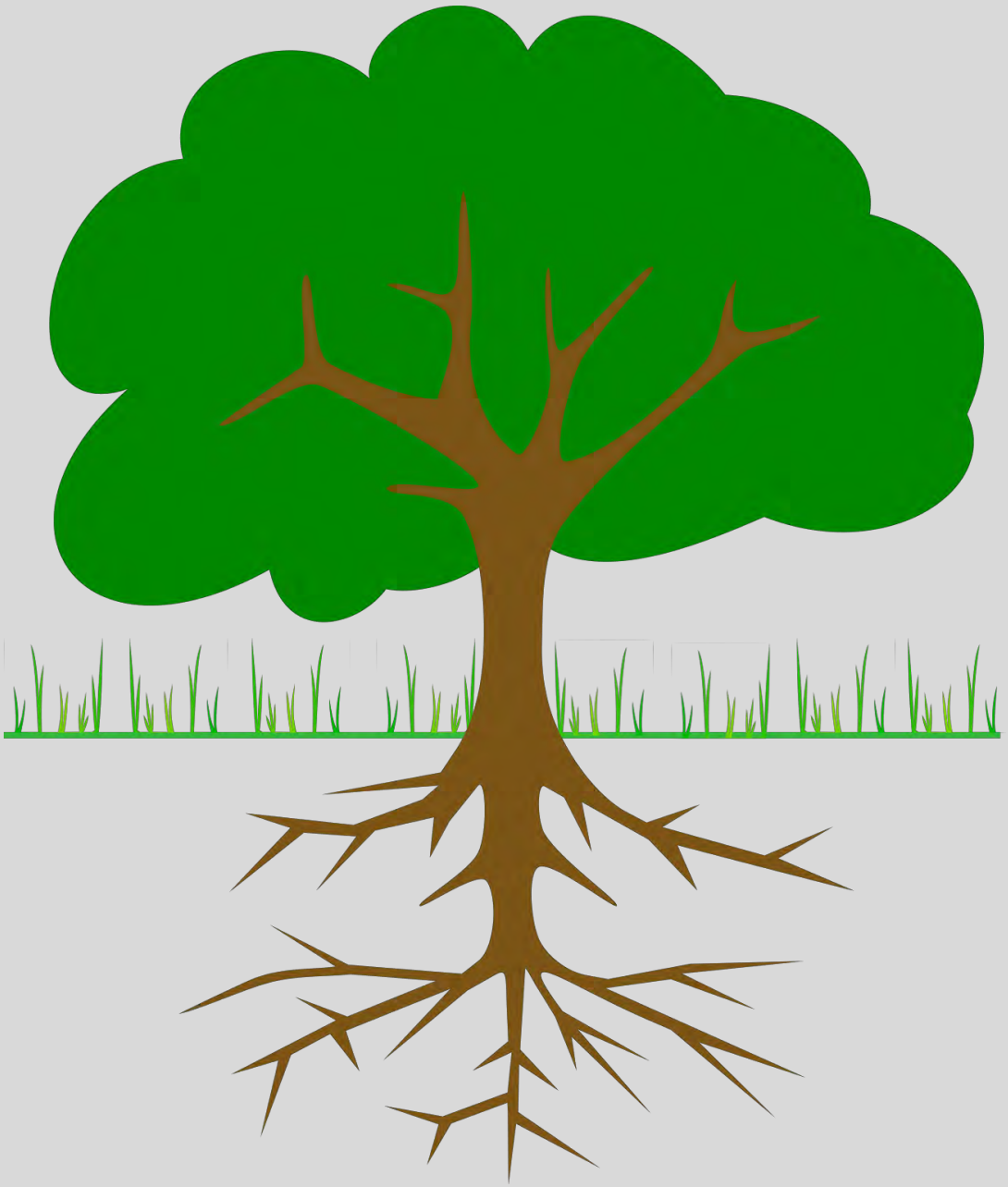
Technology Transfer



Industry

State

Academia

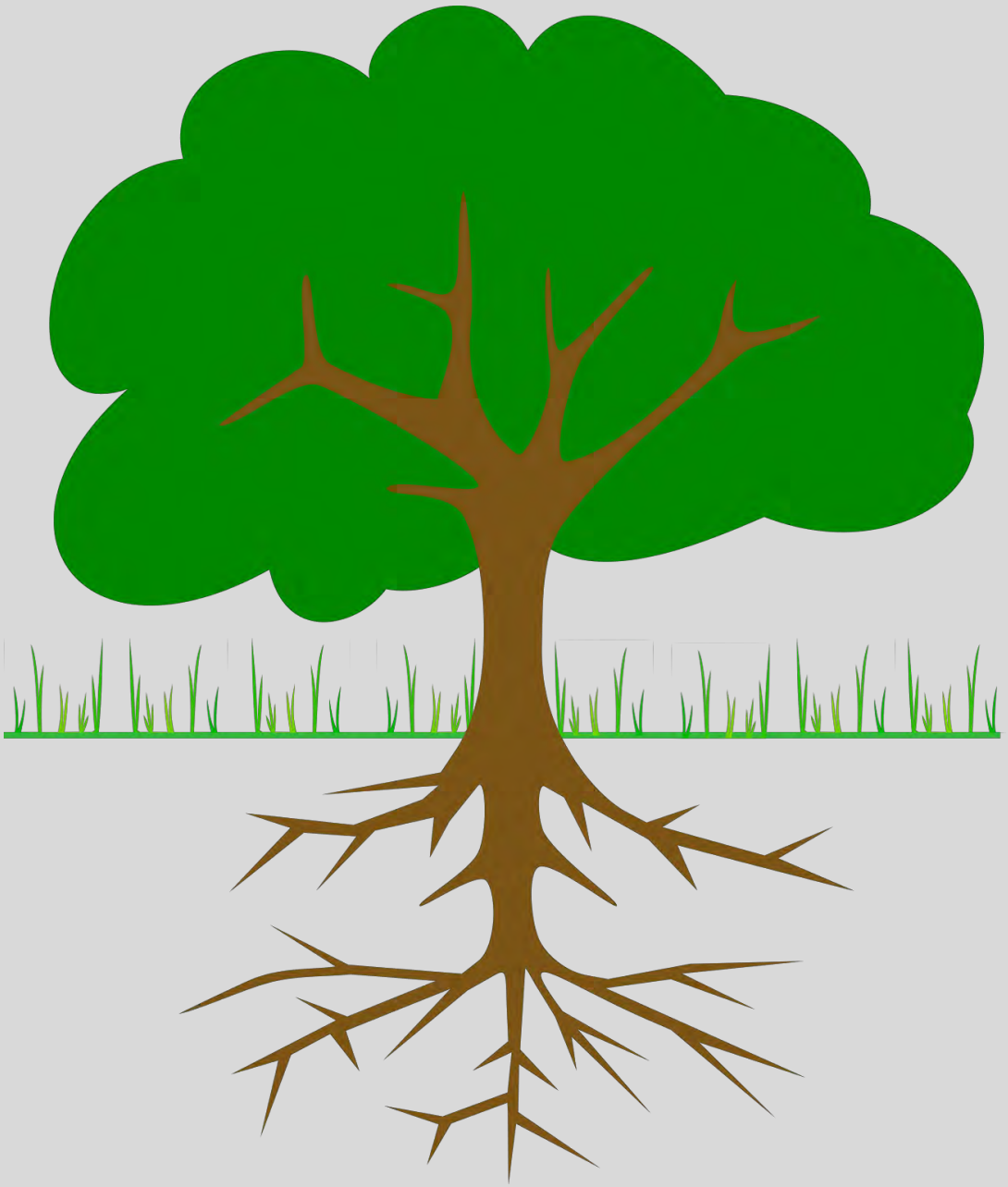


Technology Transfer

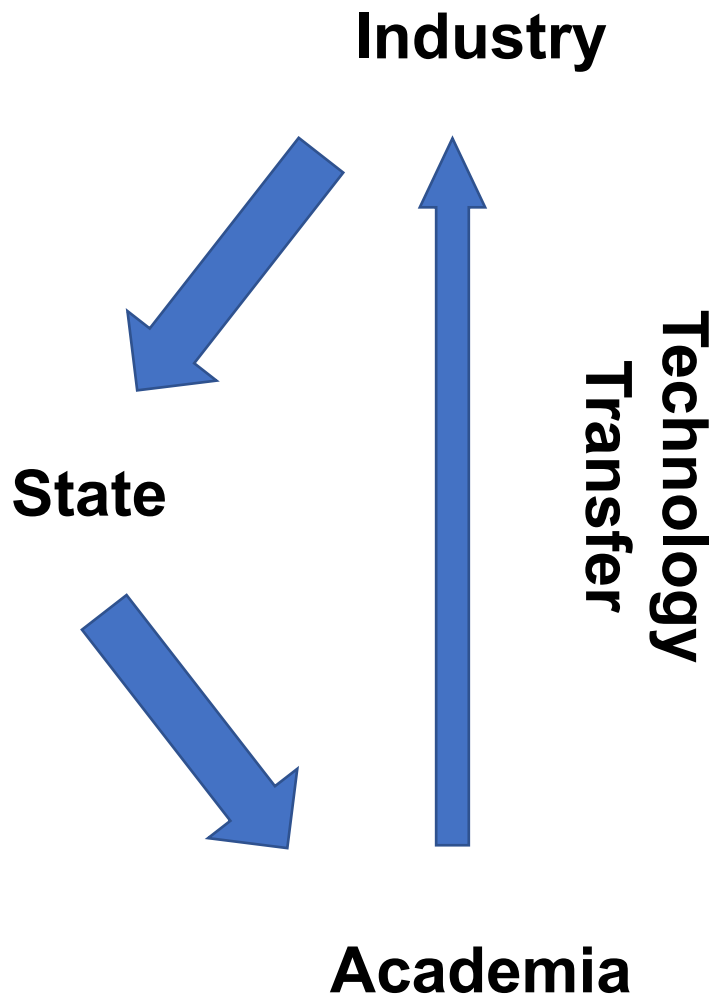
Industry

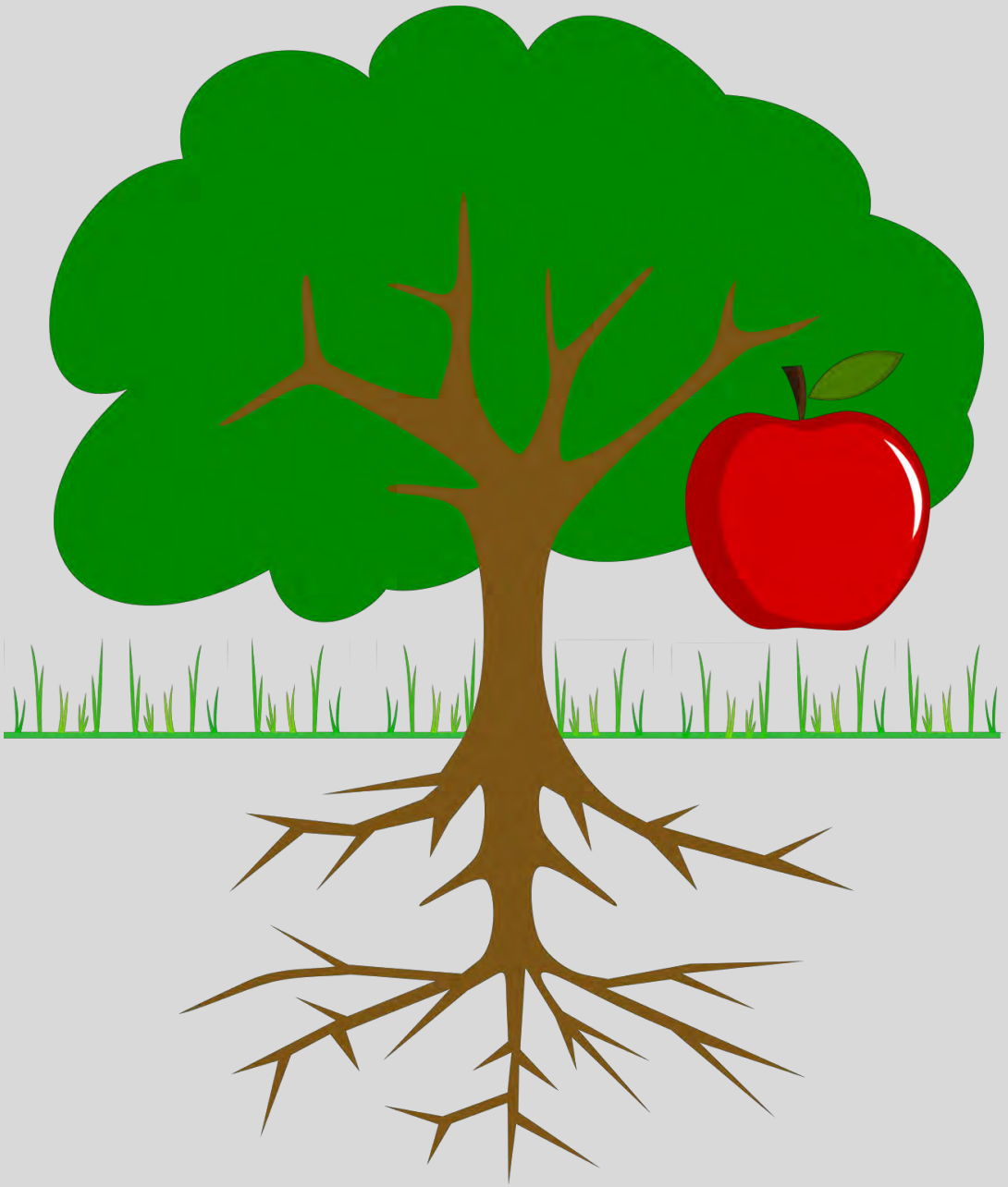
State

Academia

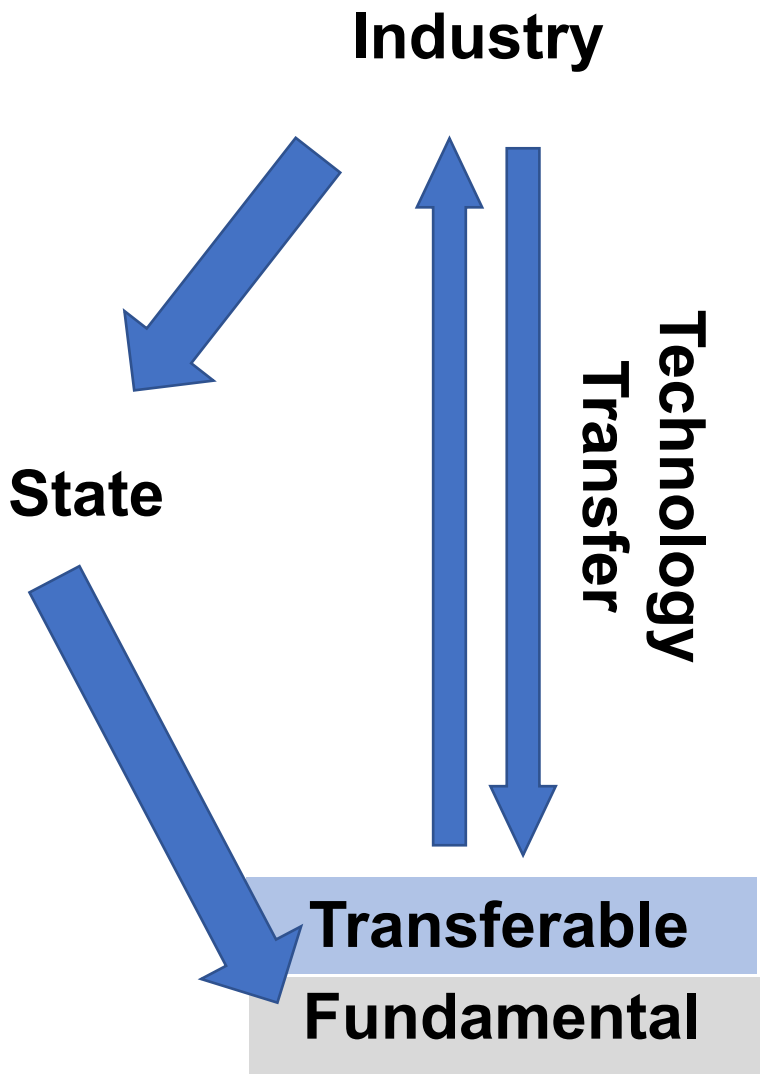


Technology Transfer





Technology Transfer



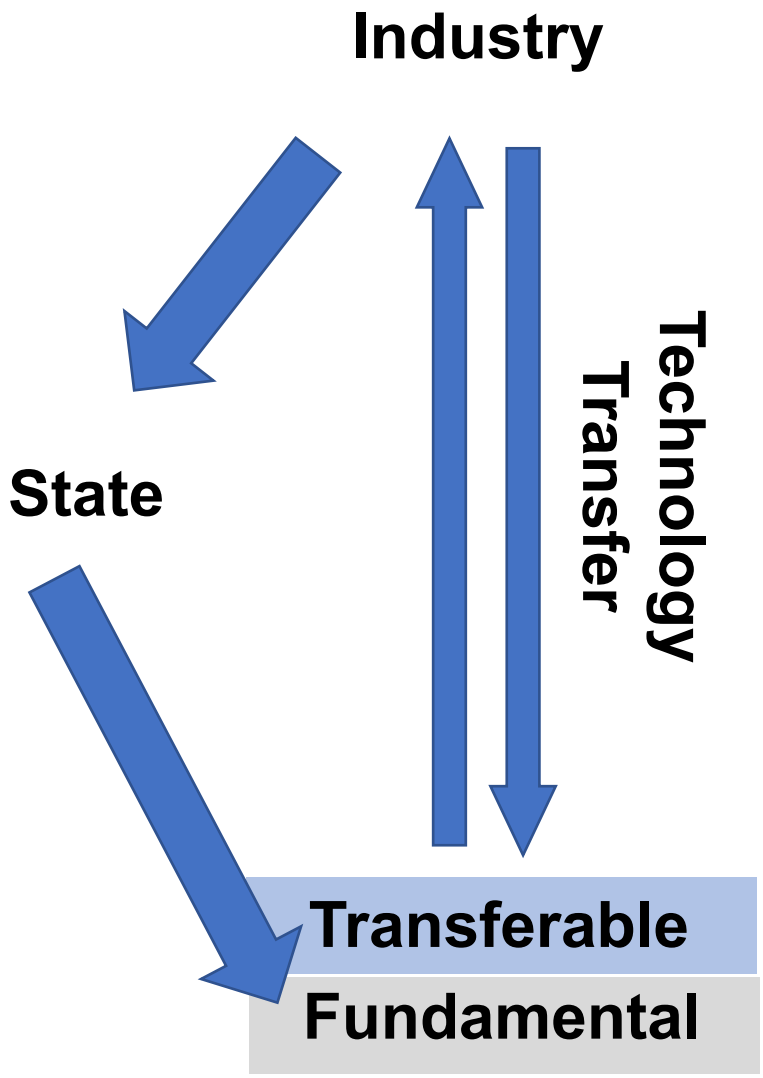
- R&D cooperation
- Contract research
- Knowledge transfer
- Licensing
- Spin-off

Technology Transfer

We make science applied

by
utilizing scientific results

for
maximization of social and economic impact



- R&D cooperation
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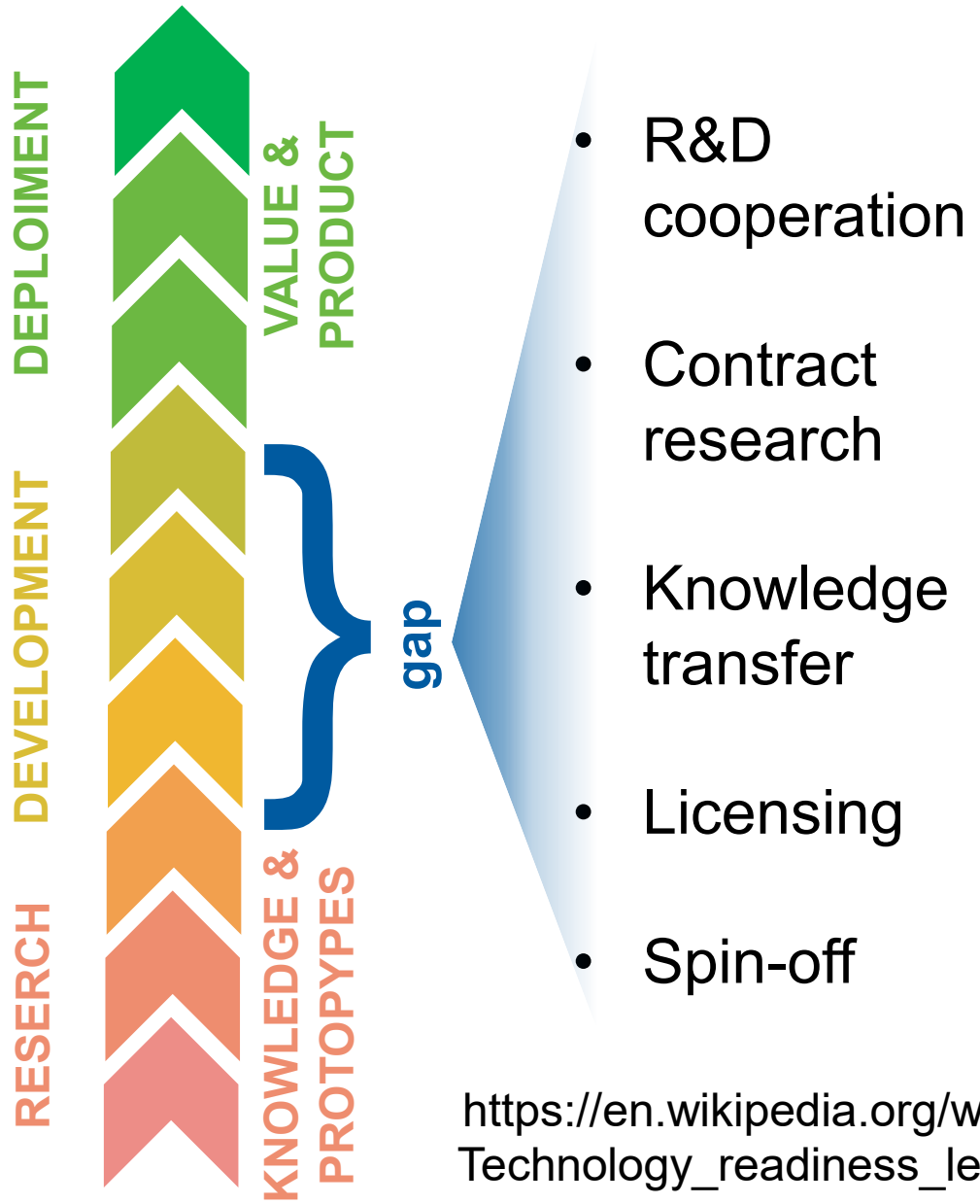
- Licensing
- Spin-off

Technology Readiness Level

- System proven in operational environment
- System complete and qualified
- Prototype demonstration in operational environment

- Demonstrated in operational environment
- Validated in operational environment
- Validated in lab environment

- Proof of concept demonstrated
- Concept formulated
- Basic principles demonstrated



https://en.wikipedia.org/wiki/Technology_readiness_level

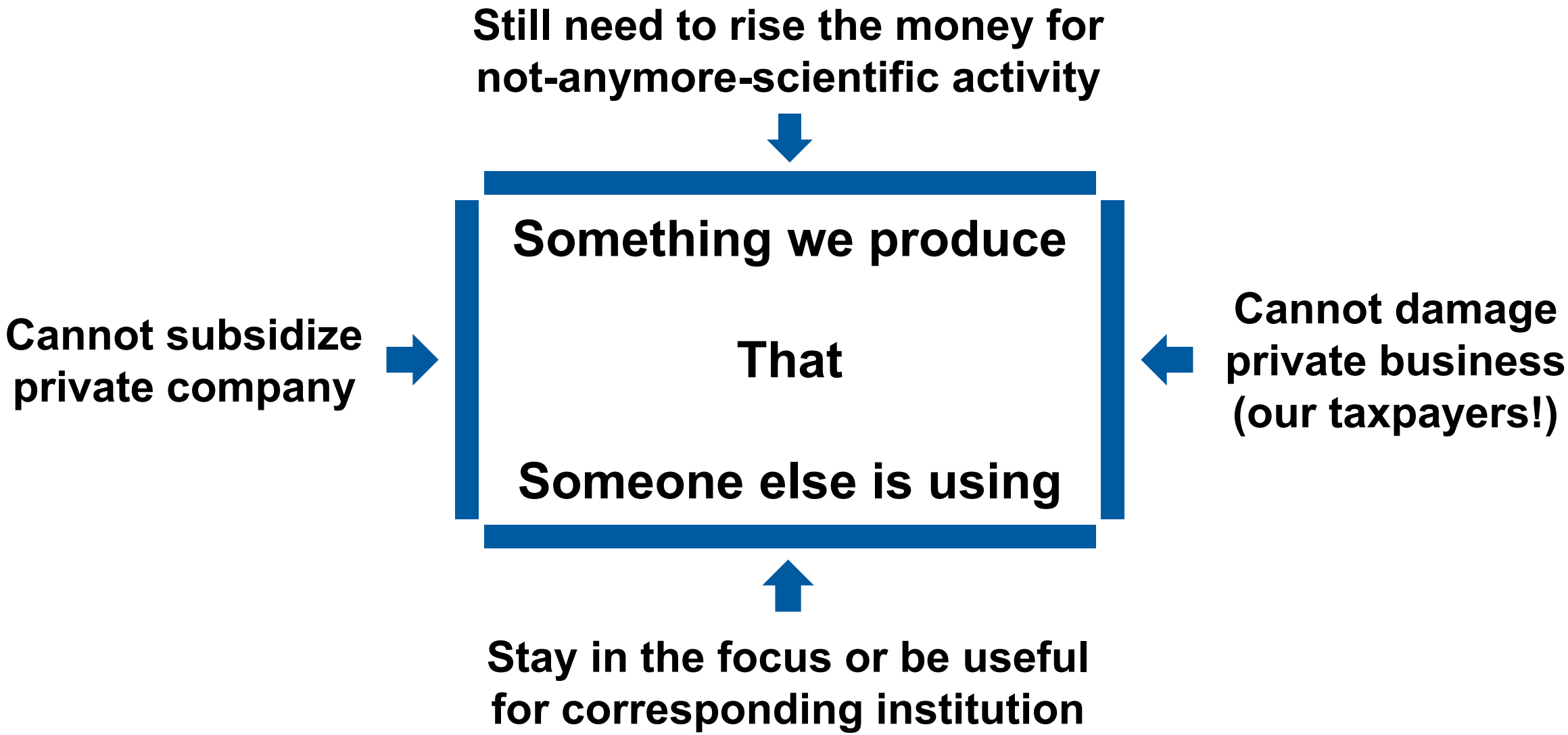
What is Transfer? Impact maximization!

Something we Produce

That

Someone else is Using

What is Transfer? [constrained]

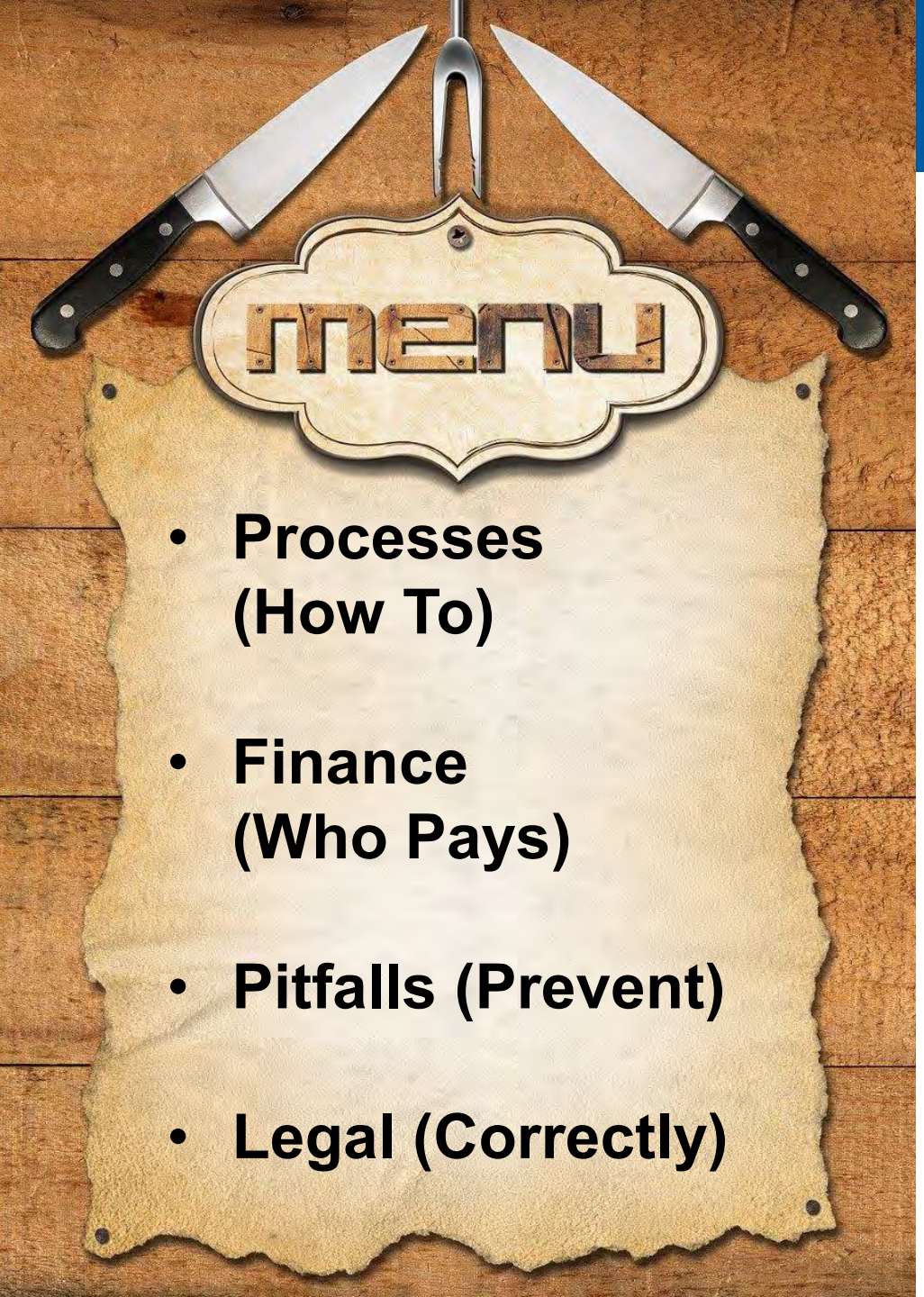


Open Transfer: Why?

- **Miss out opportunities related to OPEN**
- **Often unnecessarily effort & recourse on protecting knowledge**
- **Collaboration and synergies bottlenecks**

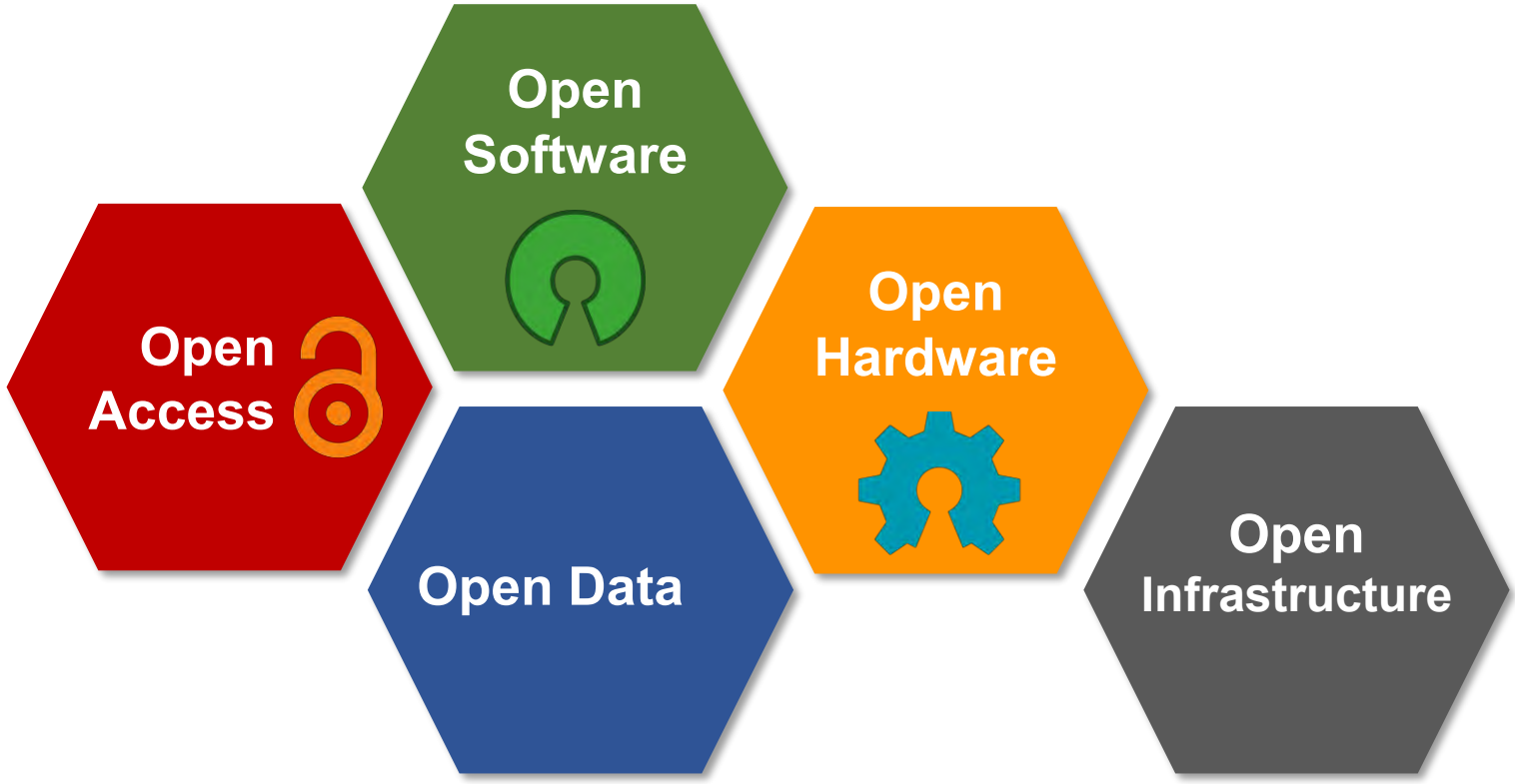
- **Take perspective of the end-product**
- **Do what is necessarily**

New OPEN tool box needed!



- Processes (How To)
- Finance (Who Pays)
- Pitfalls (Prevent)
- Legal (Correctly)

Open Transfer: What?



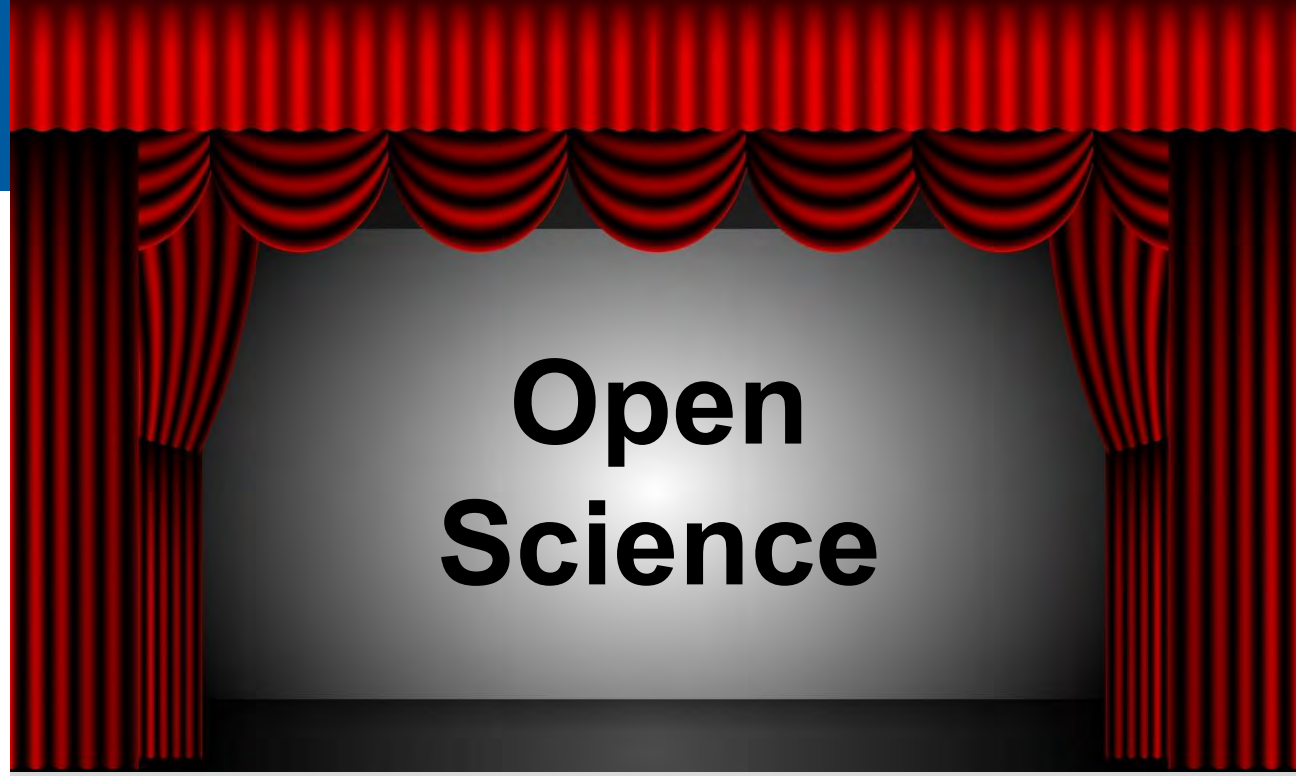
Open Science and OpenTransfer building blocks

Open Transfer: Role

Roles to choose from:

- Create or Produce
- Integrate & Share
- Teach & Consult
- Advocate

- Finance (especially revenue)
- Build a market value
- Push for adoption (marketing)
- Administrative support



Target: Measurable Social or Economical Impact

What is the impact for Technology Transfer?

- **Industrial partner further develops and integrates our developments**
- **Our developments enable companies / products / … to exist**
- **New jobs outside of academia are created**
- **Another academic partner saved resources on not repeating our work**
- **…**

Software **Hardware** **Data** **Infrastructure**

Transfer takes a Product (Business) Perspective:

OPEN ≠ FREE of charge

Costs:

Not an academic problem

- Development & Scaling
- Maintenance & Support
- Outreach / Marketing

Why pay? Added value:

- Expertise: build, use, adapt, ..
- Infrastructure & processes
- Community leverage

(!) Someone has to pay for it

(consider paying for Open Source)

(!) You can get money for Open Source

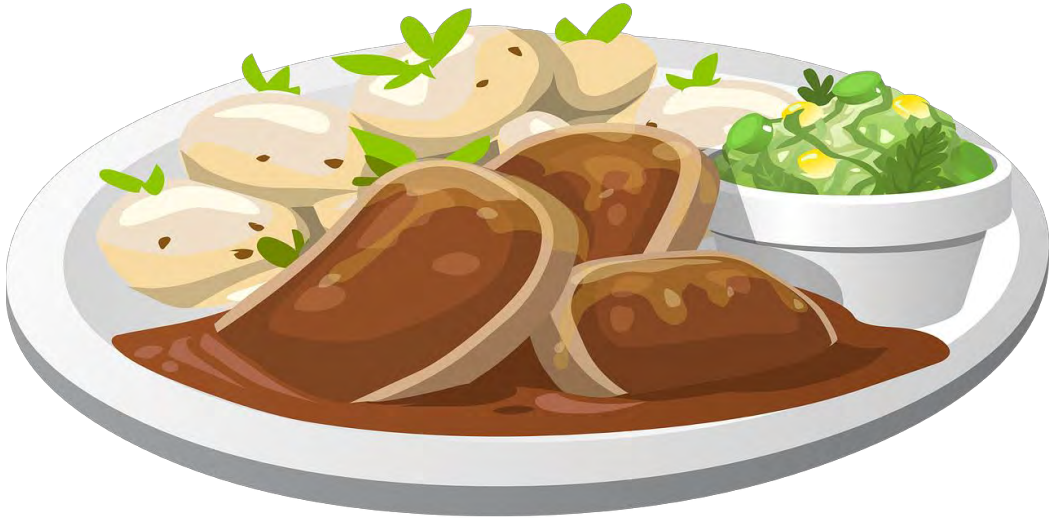
Technology ≠ Product

Profitable Business utilizing Open Source

- GaudiLabs LLC
- Open UC2 GmbH
- Arduino
- White Rabbit
- Open Source MRI

Metaphor: Recipe vs Meal

vs



Technology & IP ≠ a product or service:

OpenDrop / OpenDropV4 / Hardware /

GaudiLabs Added Feedback Reading — f6664ee · last year — History

Name	Last commit message	Last commit date
..		
CartridgBar.STL	Production Version OpenDrop V4	3 years ago
CartridgBarMagnetV2.STL	Added Feedback Reading	last year
CartridgBarUniversal.STL	Added Feedback Reading	last year
OD4f.rd	Production Version OpenDrop V4	3 years ago
OpenDropBaseV4_fit.ai	Production Version OpenDrop V4	3 years ago
OpenDropJoystickCapV4_cross.STL	Added Feedback Reading	last year
OpenDropV4.STEP	added STEP 3D files	2 years ago
SideFoilV4_final.ai	Production Version OpenDrop V4	3 years ago
TinyCover3.STL	Added Feedback Reading	last year
side41.rd	Production Version OpenDrop V4	3 years ago

OpenDrop V4 – Digital Microfluidics Platform

€975.00 – €1,595.00

- **Open is a feature worth paying for!**

https://github.com/GaudiLabs/OpenDrop/tree/master/OpenDropV4
https://www.gaudi.ch/GaudiLab

When OPEN doesn't work

- One must make additional pre-profit investments into the technology

- There is little competitive advantage besides the protected intellectual property (others can easily replicate)

If Not Protected:

Technology / Drug / Method / … becomes commercially poisoned and avoided

Example

When OPEN does work

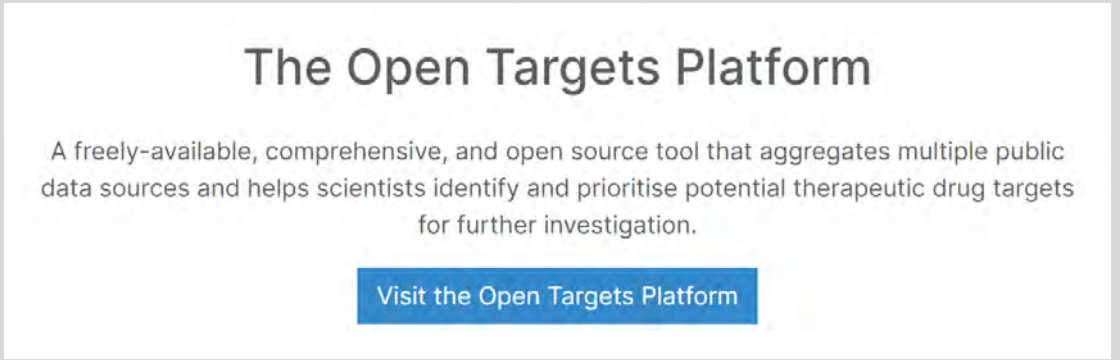
- **The technology / methods / knowledge is a common building block and there is something else to protect the competition**

Competitive advantages:

- **6 months embargo period**
- **Seats at the table**

*** Patents are still filed in a later stage**

Counter Example



https://www.opentargets.org/

Who would pay? OPEN for industry setting?

Advantages OPEN

- Community leverage
- Trust and brand
- Free usage as a marketing

Questions to answer

- What is the value for others?
- What you open / What you sell?
- Competitive advantage?

Selling points of OPEN

- Customer engagement
- Product sustainability
- No vendor-locking

Science / research specifics

- Open science notion
- Often niche (low completion)
- Collaboration is a culture

OPEN revenue models:

How to financially sustain your Open source project?

OPEN revenue models:

- Selling the product (+ add-ons)
- Selling warranty and support
- Software / Data / Hardware as a service
- Renting out Trademark
- Selling Certification (related Trademark)
- Consultancy and training
- Contract R&D
- Partnership / Membership
- Sponsorship / donation
- State money for strategic Open R&D

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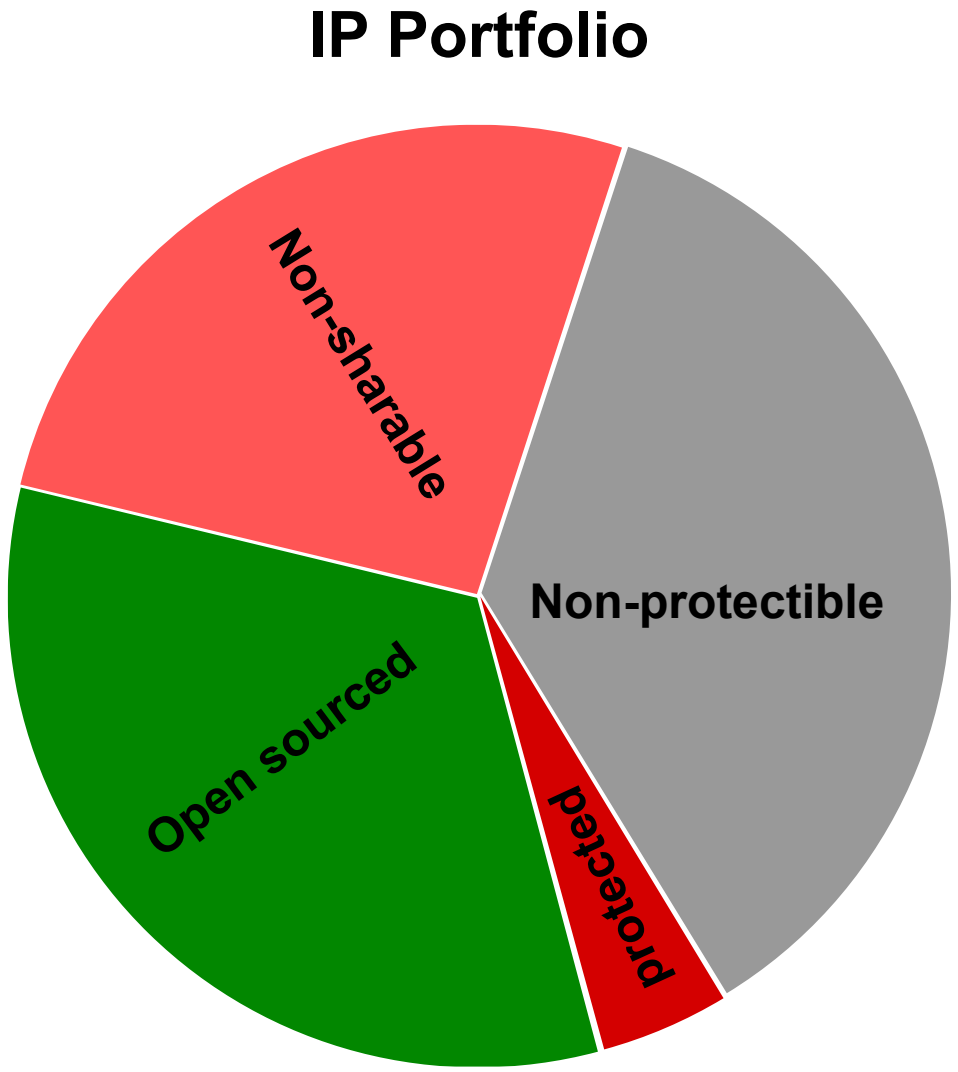

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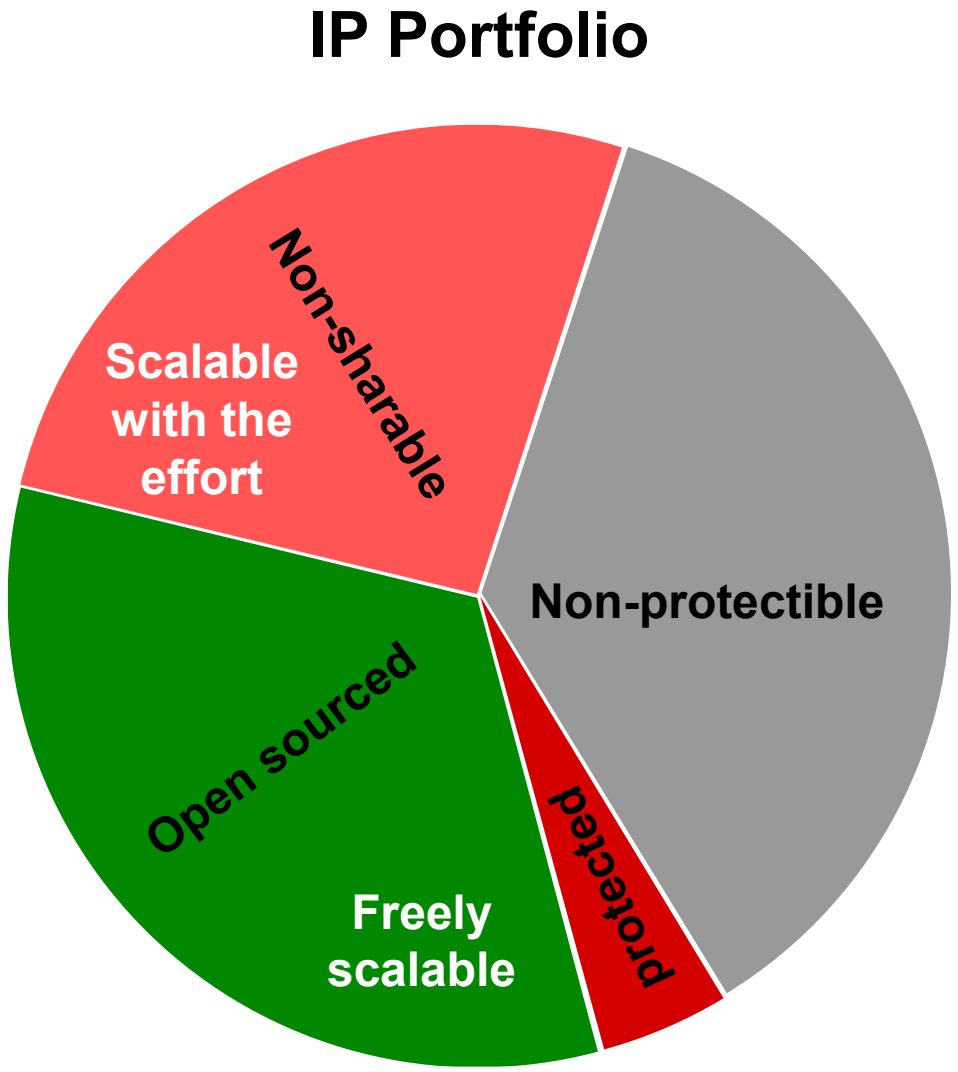


Open Transfer:

- Training
- Consultancy
- Certification

Example

Open Transfer

Open Source & and Open Accesses:

- **Talks & Presentations:**

  materials, slides, video recordings

- **Knowledge:**

  Everything we collect we will publish

  (as long as not confidential)

Protected:

- **Brand: OPEN TRANFER Trade Mark**

Some more examples

Example. Academic transfer out: (barter)

Parallel programming library that also solves vendor locking problem (use CPUs, GPUs and FPGAs!)

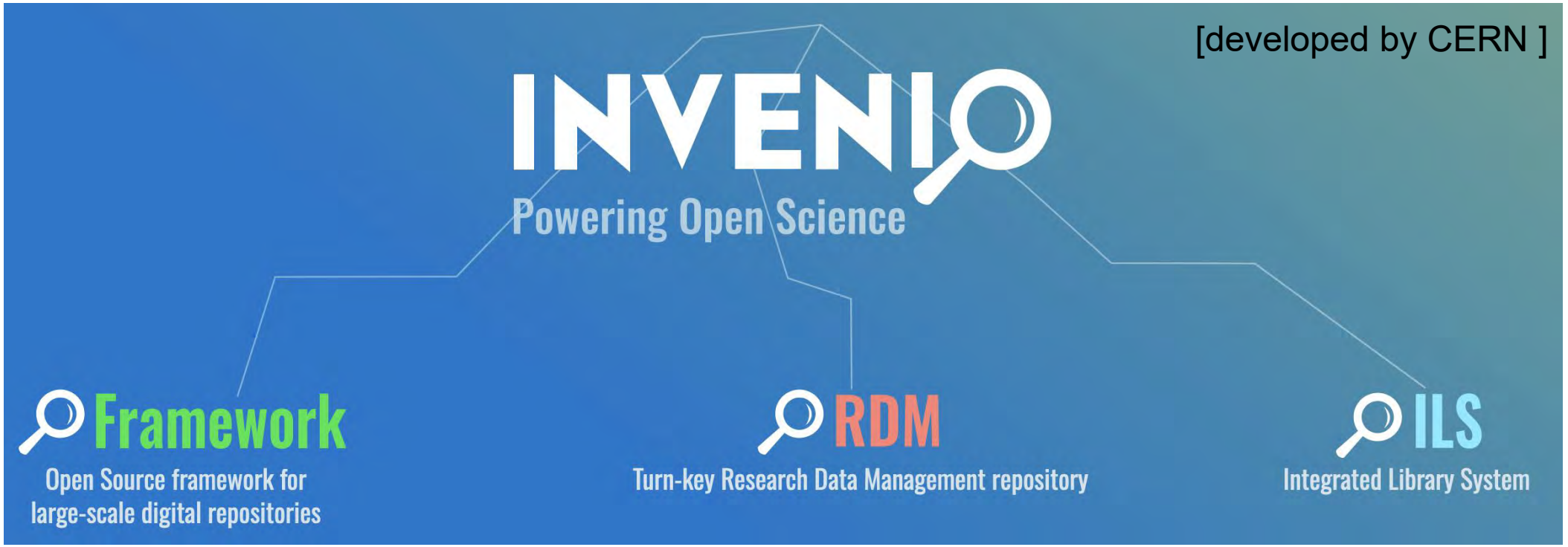
Developed for PIConGPU (HZDR)

Used and further developed at CERN

https://hifis.net/spotlights/picongpu

https://www.hzdr.de/publications/PublDoc-16960.pdf

Example. Academic transfer in: (barter)



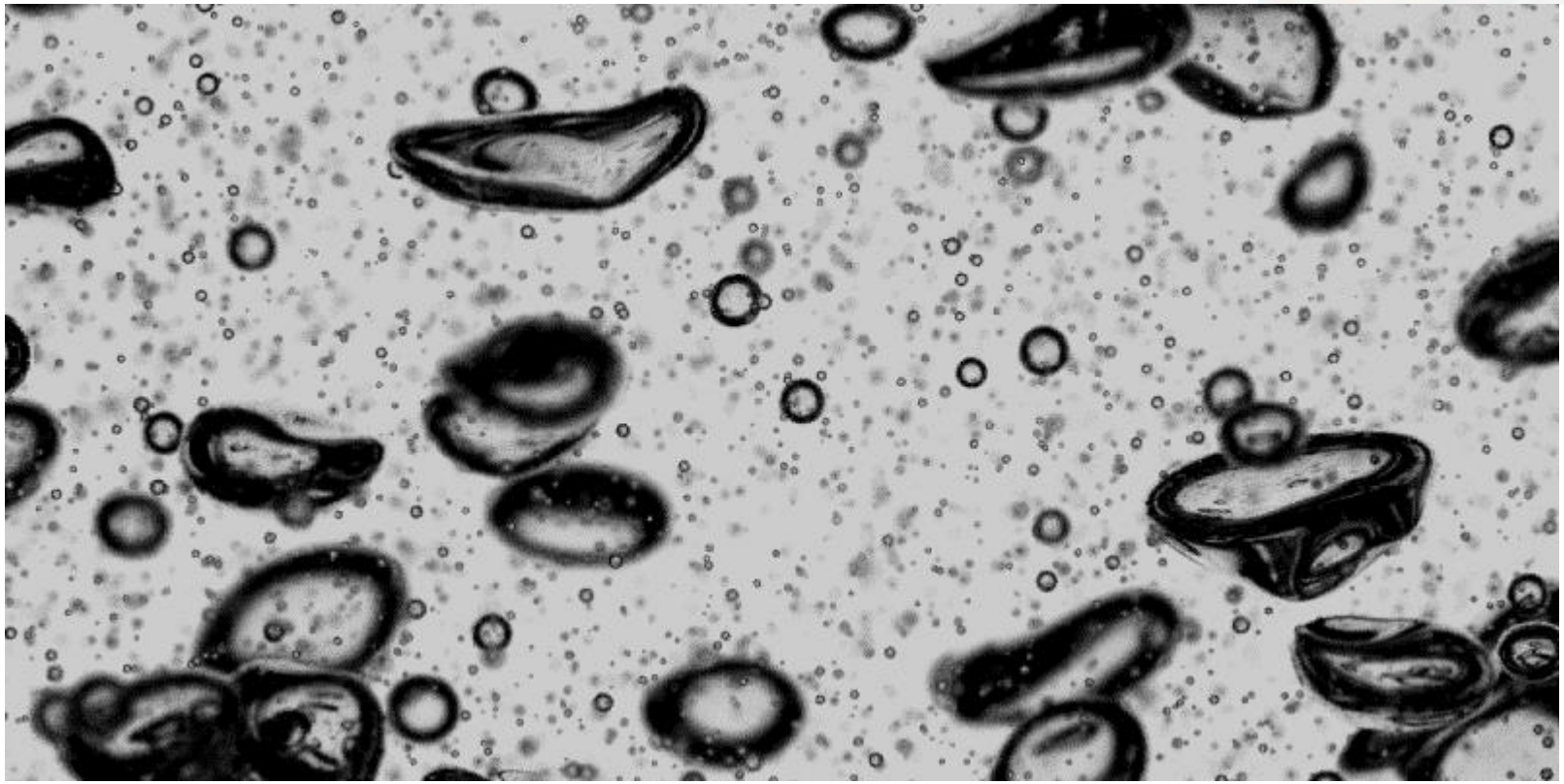
https://inveniosoftware.org/

Example. INVENIO commercial:

https://inveniosoftware.org/

Example. open-sourced based collaboration:

OpenFOAM
The OpenFOAM Foundation



https://www.hzdr.de/db/Cms?pOid=50526&pNid=121&pLang=en

https://openfoam.org/

Example. OPEN Data:

The Thermodynamic Reference Database (THEREDA) is designed for geo-chemical models in the context of a radioactive waste repository.

KIT Karlsruher Institut für Technologie

GRS

TU BERGAKADEMIE FREIBERG

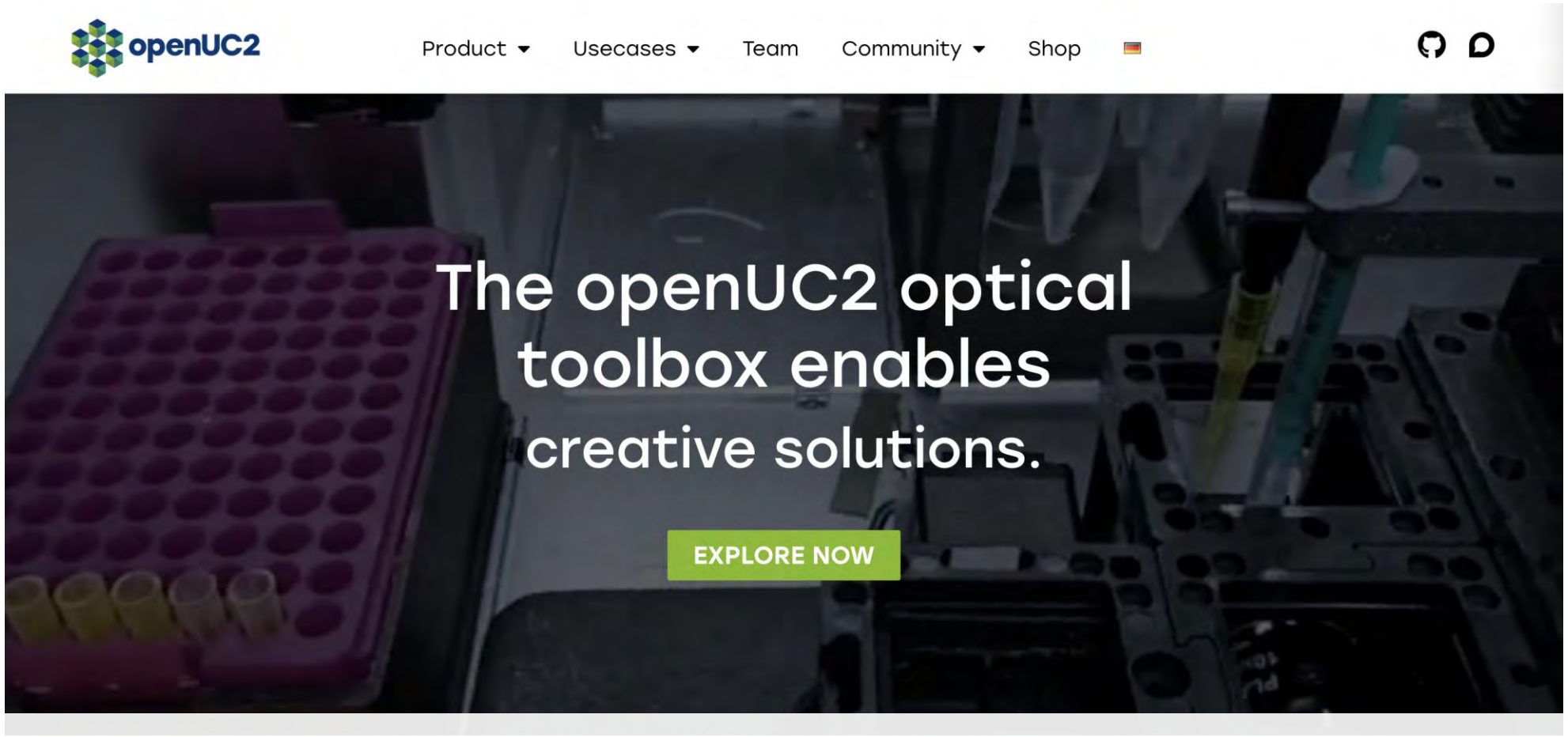
TUBAF Die Ressourcenuniversität. Seit 1765.

HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

CSDENGINEERS+

https://www.thereda.de/en

Example. OPEN Hardware: business



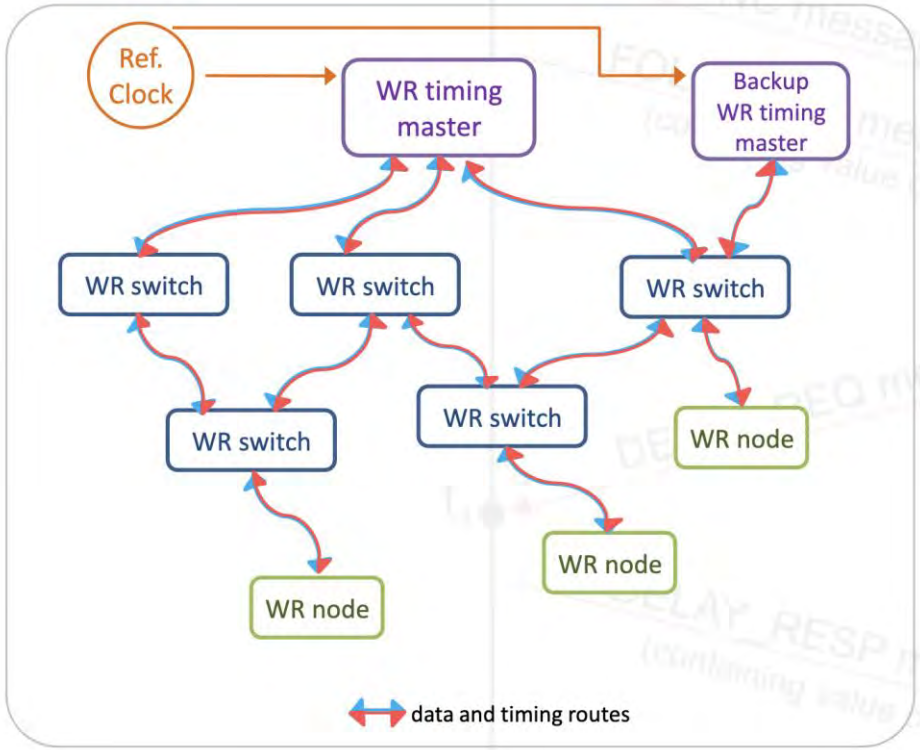
Revenue model: Selling Hardware as a product

https://openuc2.com/

Example. OPEN Hardware: business enabler

CERN

The White Rabbit Project



Revenue model:

- **Certification and related Trademark**
- **Consultancy and training**
- **Partnership / Membership**

https://white-rabbit.web.cern.ch/

Open source as an investment strategy

Use, Adopt, Develop, and buy Open Source:

- Open source blocks vendor locking
- Open source can ensure the sustainability (todays library example!)
- Open Source saves recourses (money included)

Take-Home Message

- Europe is making a strategic shift towards openness and open-based collaborations. (community driven!)

- OpenTransfer is developing the open toolkit and strategy in the Technology Transfer domain.

- Major Challenge of Openness for Transfer are:
  - Economical sustainability
  - Industrial partners' adoption
  - Legal and Ethical aspects in the future

- Technology transfer is not the barrier for Open Science. We simply want to avoid pitfalls

Open Transfer

Talk to us: we push scientific results to have more social and economical impact

- Business processes & financing
- Partnership search & arrangements
- Legal and administrative support

Vladimir Voroshnin
v.voroshnin(at)hzdr.de

Open Hardware in practice - The OpenFlexure Microscope

Julian Stirling

Helmholtz Open Science Forum, 22nd January 2024

The OpenFlexure Microscope

openflexure
microscope

Motorised, digital, laboratory-grade microscope

Mechanical stage is 3D printed

Design optimised for plastic (not a cheap imitation)

Anyone can reproduce the design, all project information is open

Focus on medical, research, and educational use.

Openness builds a research community

METHOD ARTICLE

Adapting the 3D-printed Openflexure microscope enables computational super-resolution imaging [version 1; peer review: 2 approved]

Stephen D. Grant, Gemma S. Cairns, Jordan Wistuba, Brian R. Patton

Department of Physics and SUPA, University of Strathclyde, Glasgow, UK

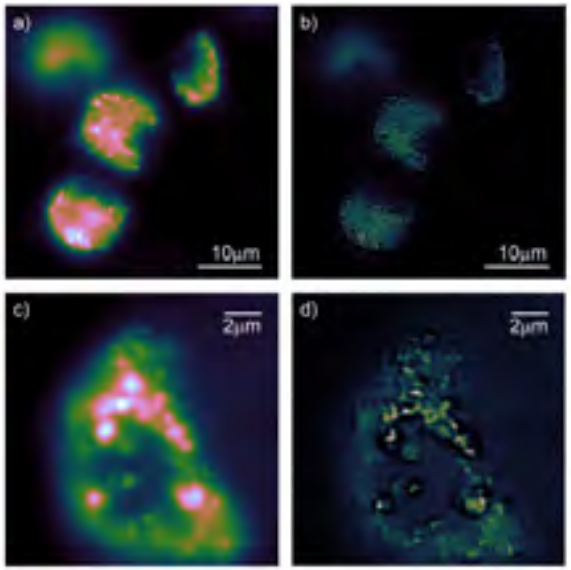


Figure 3. **Fluorescence imaging of 90 nm nanodiamond in monocyte-derived macrophages.** The nanodiamonds

Research Article

Optics EXPRESS

Optical sectioning robotic microscopy for everyone: the structured illumination microscope with the OpenFlexure stages

TATSUNOSUKE MATSUI AND DAIGO FUJIWARA

Department of Electrical and Electronic Engineering, Graduate School of Engineering, Mie University, 1577 Kurimamachiya, Tsu, Mie 514-8507, Japan

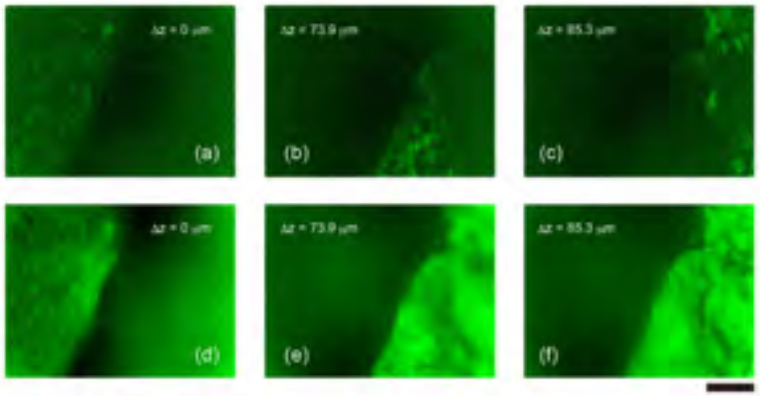
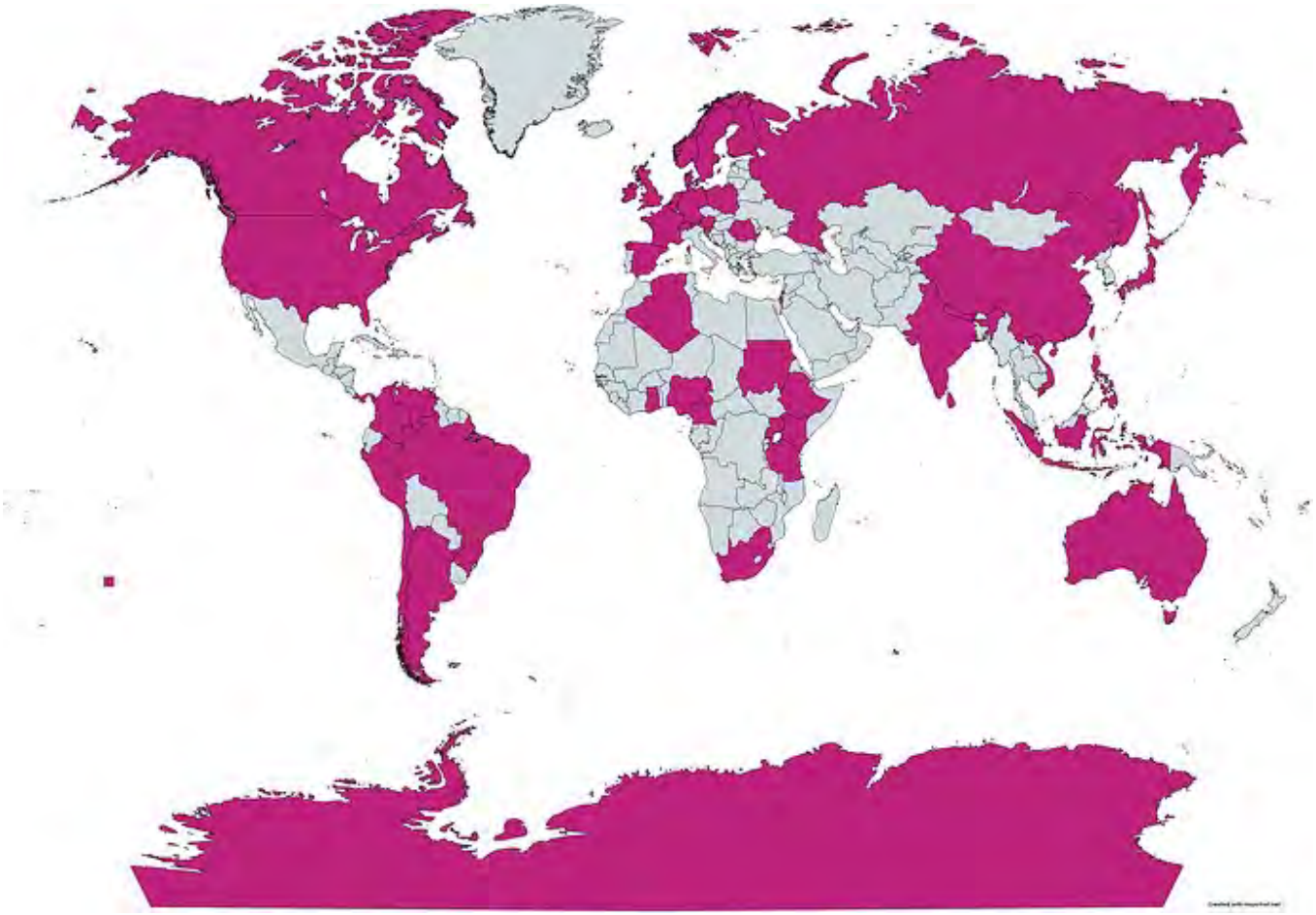


Fig. 4. (a)–(c) Optically sectioned and (d)–(f) conventional images obtained from corresponding images shown in Figs. 3(d)–3(f) by post-processing with Eqs. (1) and (2), respectively. These are at different axial positions of (a,d) $\Delta z = 0\,\mu m$, (b,e) $\Delta z = 73.9\,\mu m$, (c,f) $\Delta z = 85.3\,\mu m$, where the axial position of $\Delta z = 0$ is at the plateau ground on the coin and a positive increase in Δz corresponds to going up to the hill of the numerical character of "0". Scale bar 50 μm.

Openness builds a research community



Use in education

Use in education

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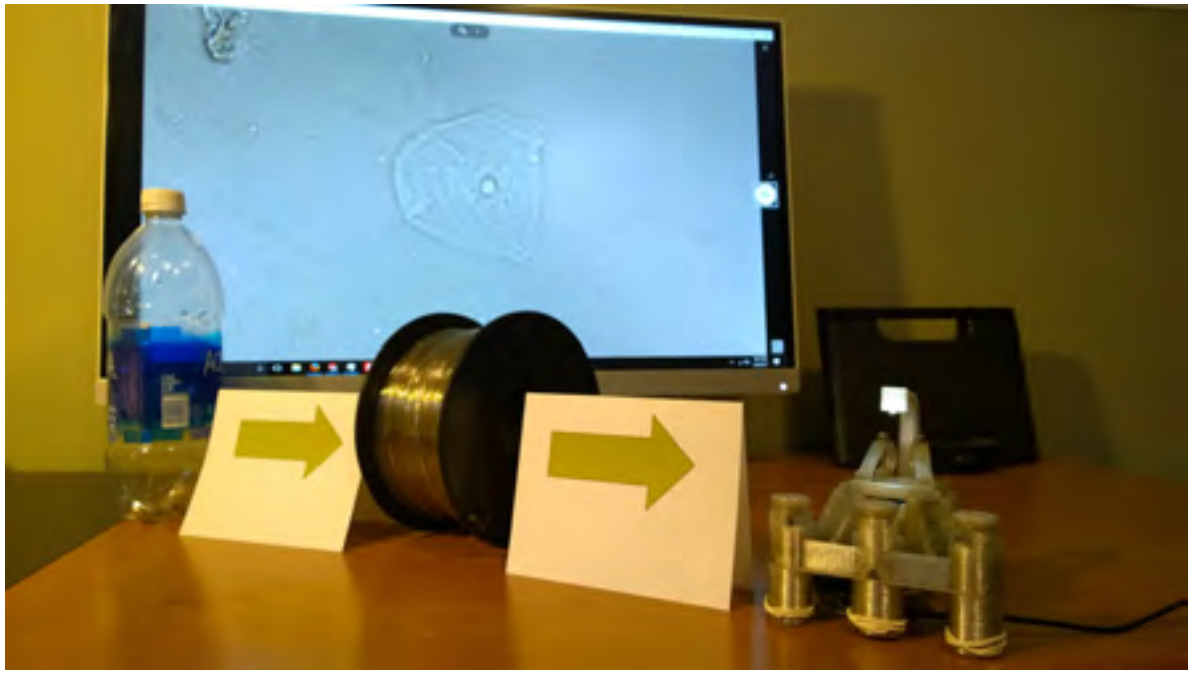
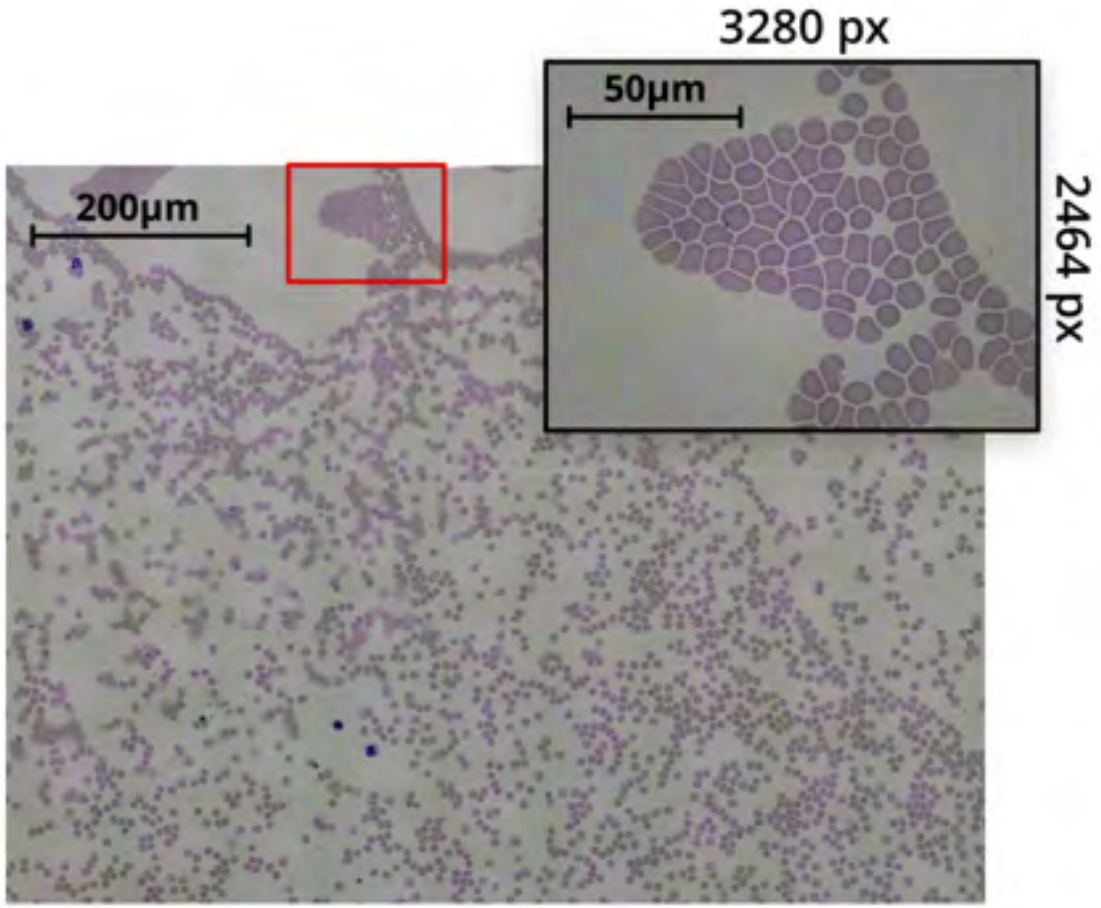


Why do we need a medical microscope?



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Why build another medical microscope?

How much does a commercial microscope cost?

Purchase cost ∼£20,000

Maintenance: Parts cost + engineer travel

Why build another medical microscope?

How much does a commercial microscope cost?

Purchase cost ∼£20,000

Maintenance: Parts cost + **engineer travel**

Key question

Can we design a microscope that is:

- Understandable by many
- Community can suggest changes
- Has variations for different purposes
- Useful for hobbyists, researchers, and education
- Can be used in a medical product across the world

Medical device design requires:

- Clear version control
- Control of what goes into the design
- Design risks assessed
- Clear, concise, up-to-date technical documentation

Medical device Quality Management

Medical device design requires:

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How hard is it to do this in the open?

What do we mean by open?

What is open hardware?

- All the plans are available for anyone to inspect
- Allows us to build on each others work
- It is **not** necessarily cheap

There is a sliding scale of openness

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- Everything Patented
- Design files private
- Trade secrets

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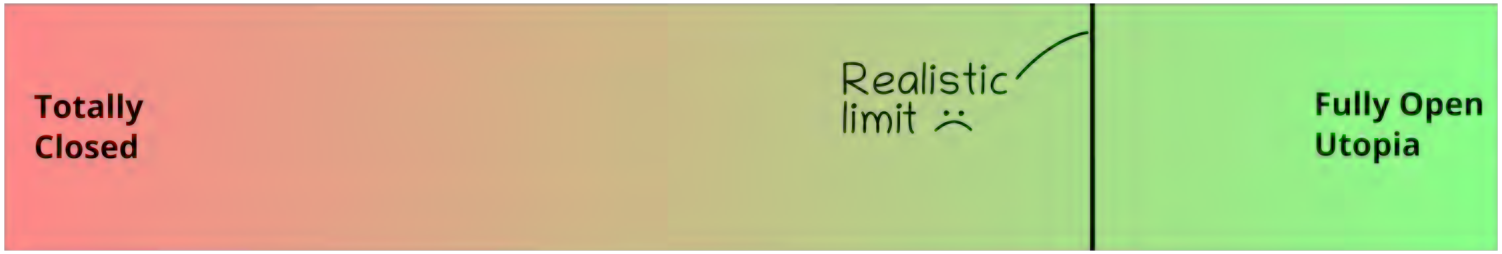
- Trade secrets

- Openly licensed
- Full history of original design files is available
- Design intent explained
- Move the conversation online
- Fully documented
- Fully open toolchain

There is a sliding scale of openness



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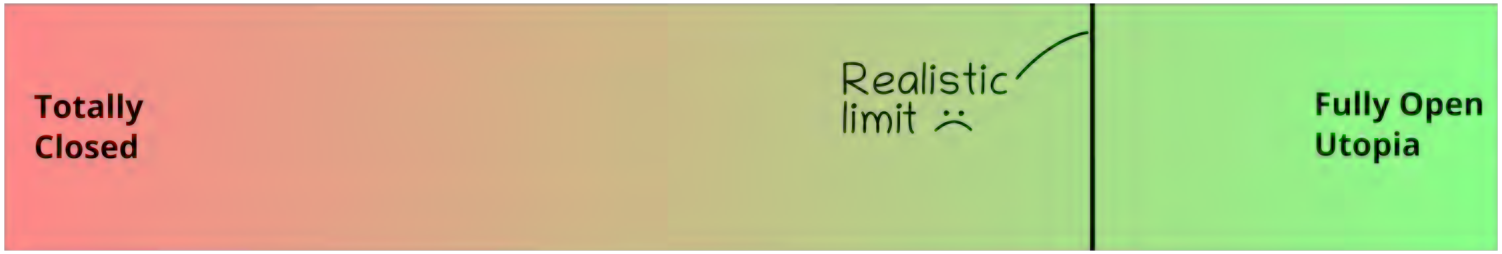

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Openly licensed

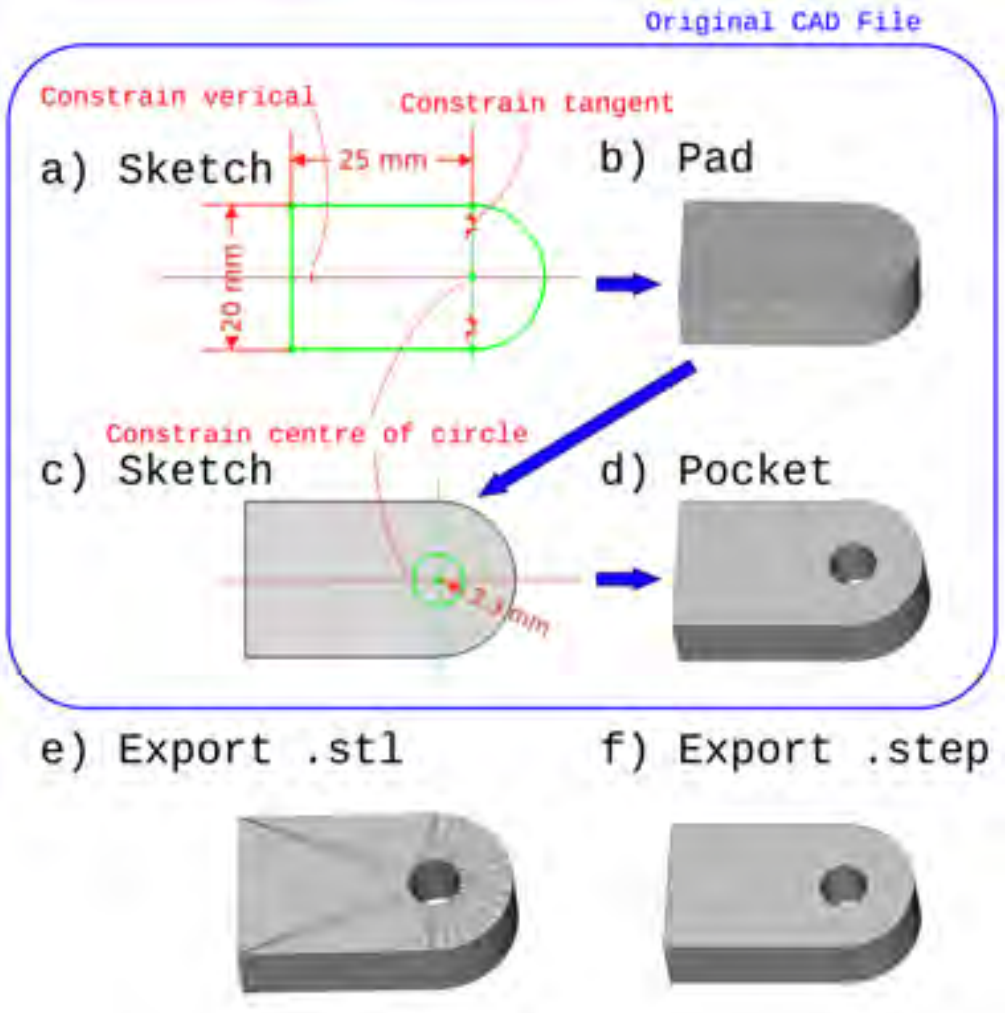
Allows the user to:

- Use it any way they wish
- Study and modify how it works.
- The freedom to build (and sell) new copies

Full history of original design files

Full history of **original design** files

Provide the editable files



Full history of original design files

- A final design is overwhelming
- Medical certification requires the manufacture to understand the design history

Full history of original design files

Platforms like GitHub/GitLab capture the history using Git

Full history of original design files

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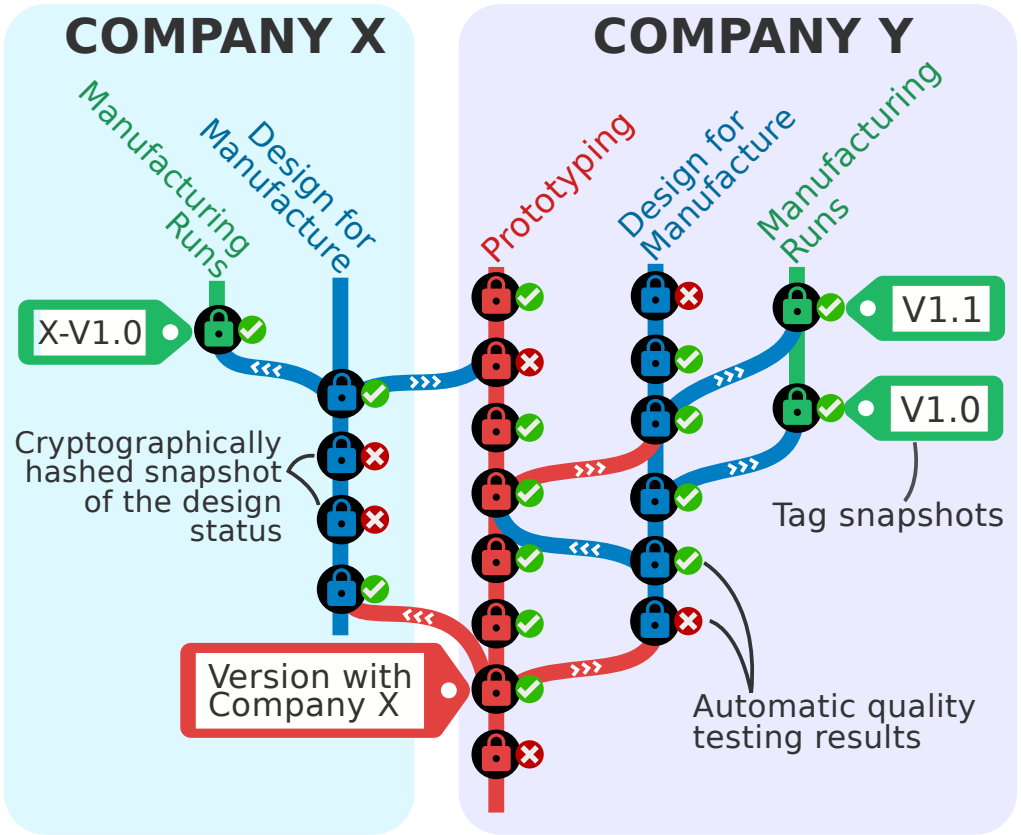
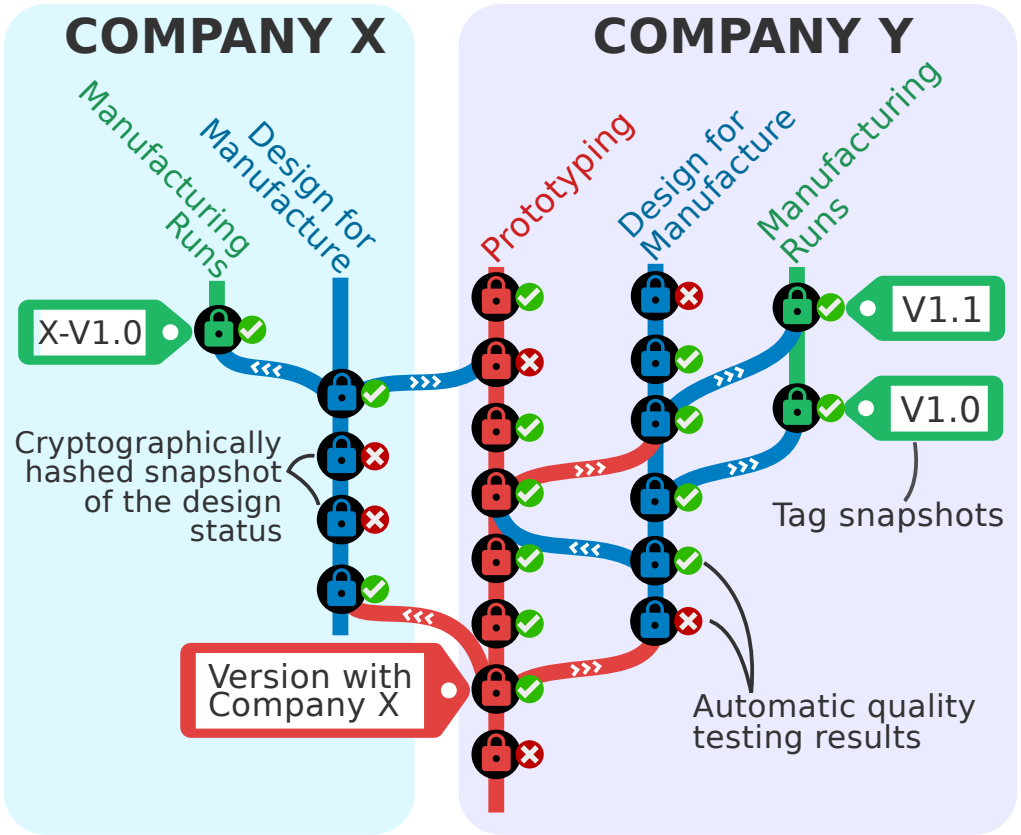


Full history of original design files

Platforms like GitHub/GitLab capture the history using Git



These platforms are designed for software development and can be hard to learn

Design intent explained

You can do this by:

- Detailed messages in your design history
- Writing documents about the design

Design intent explained

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- Detailed messages in your design history
- Writing documents about the design

The best way is...

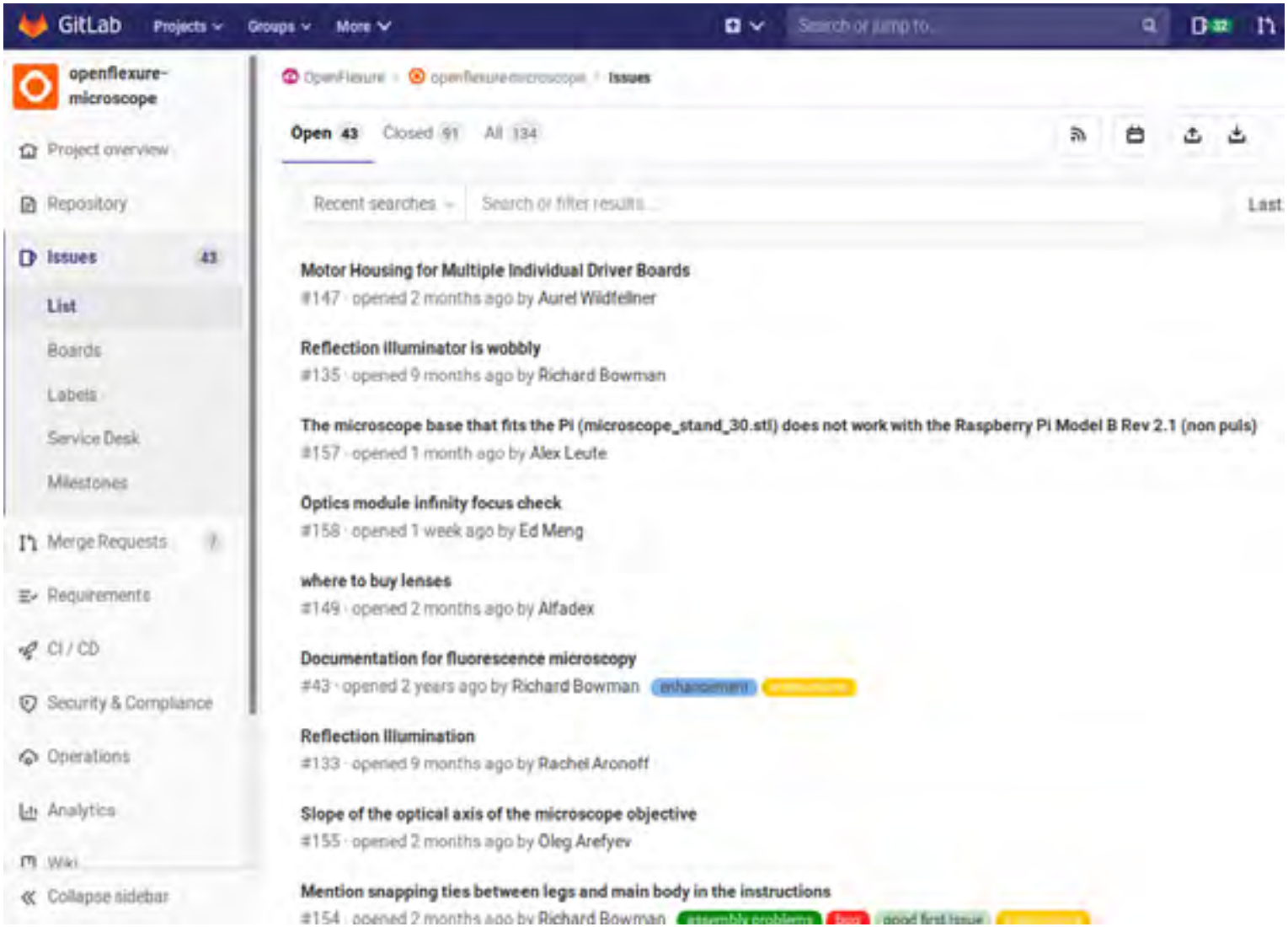
Move the conversation online

Move the conversation online

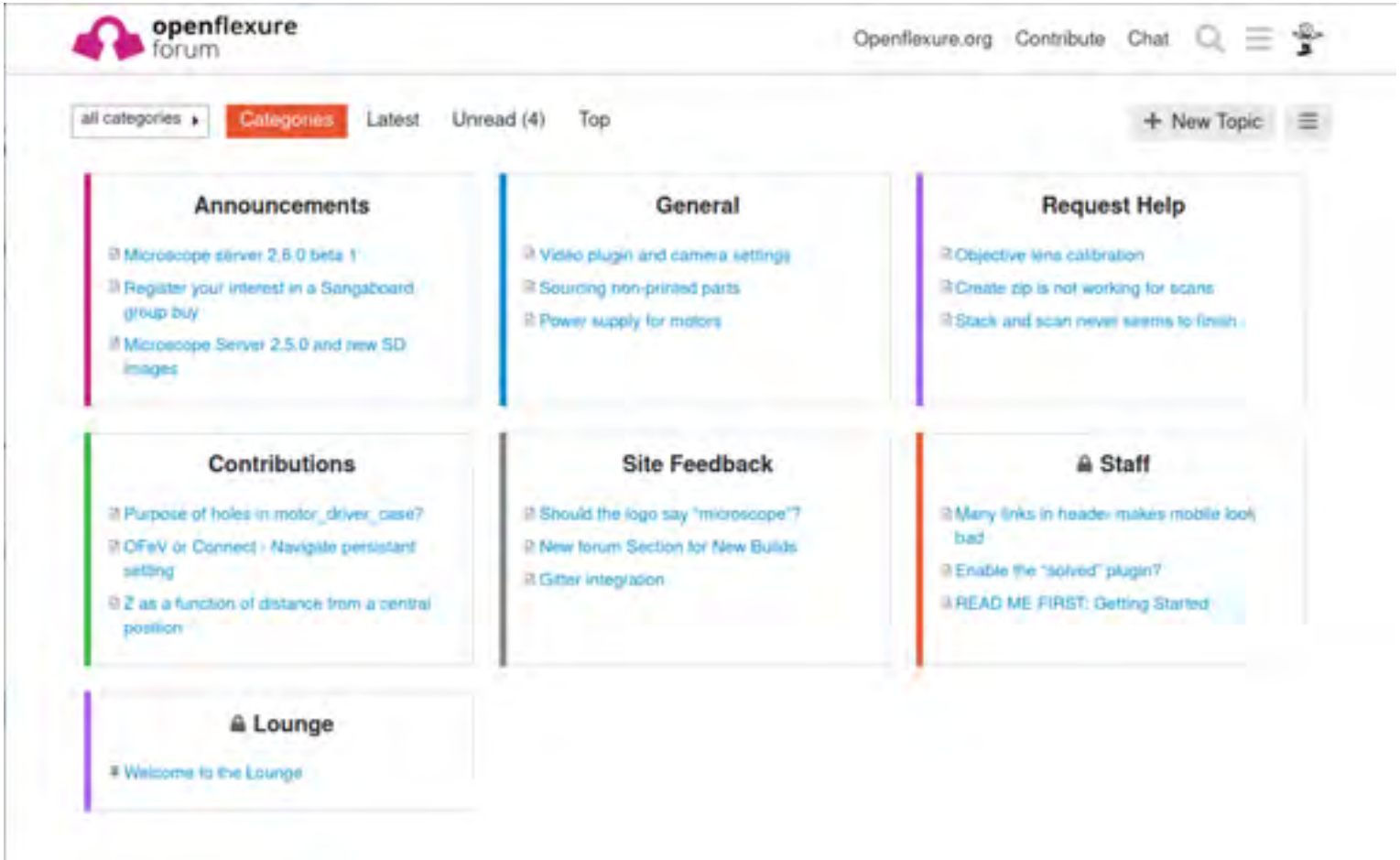
Move as much discourse as possible to a public forum

- Notice a problem - Maintain a public list
- Want to add a feature - Maintain a public list
- Need to a collaborator to help - Ask them in a public forum
- It is never too early for a project to be online

Move the conversation online



Move the conversation online



Move the conversation online

- Other experts can understand without emailing you
- More eyes on the problem
- Know-how is captured for new team members
- Someone may fix problems for you!

Fully documented

Documentation is hard!
You need:

- Assembly instructions
- Quality control instructions
- Maintenance instructions
- User instructions

They go out of date and become inconsistent FAST

Fully documented

My project:  GitBuilding

Goals:

- Automate difficult/boring tasks
- Integrate with Git
- Help generate Quality Management documentation

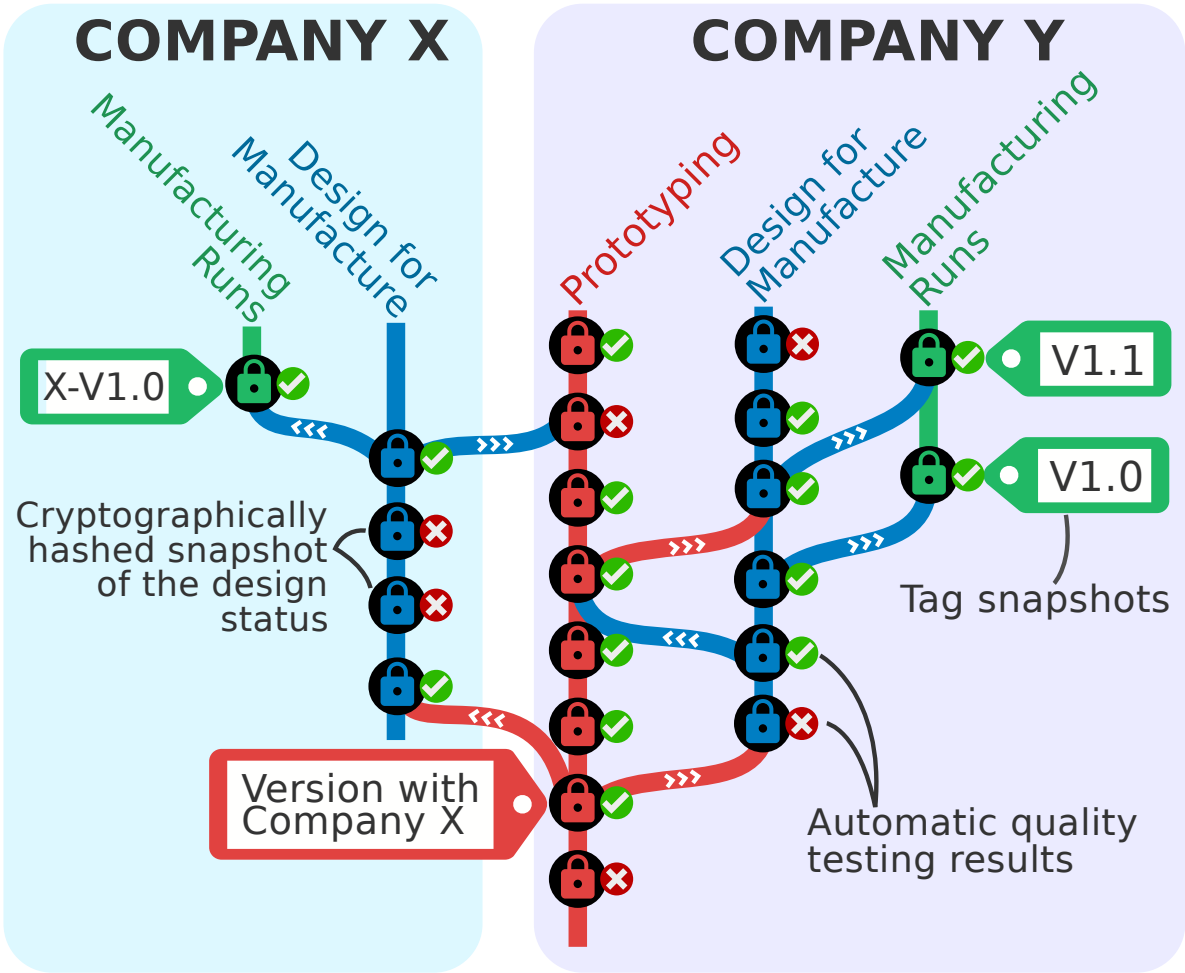
Fully open toolchain

In an ideal world everything needed to use, build, or modify the design should be open.

In reality this is very difficult.

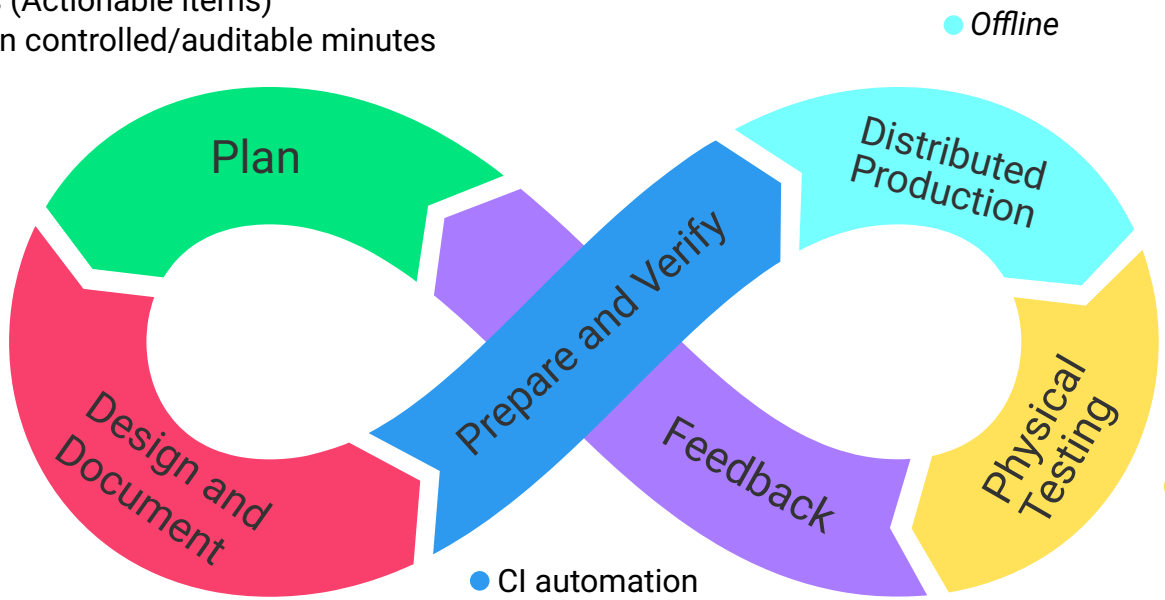
Have to balance **improving access** with **making progress**.

Open toolchains in practice: The OpenFlexure Toolchain



HardOps

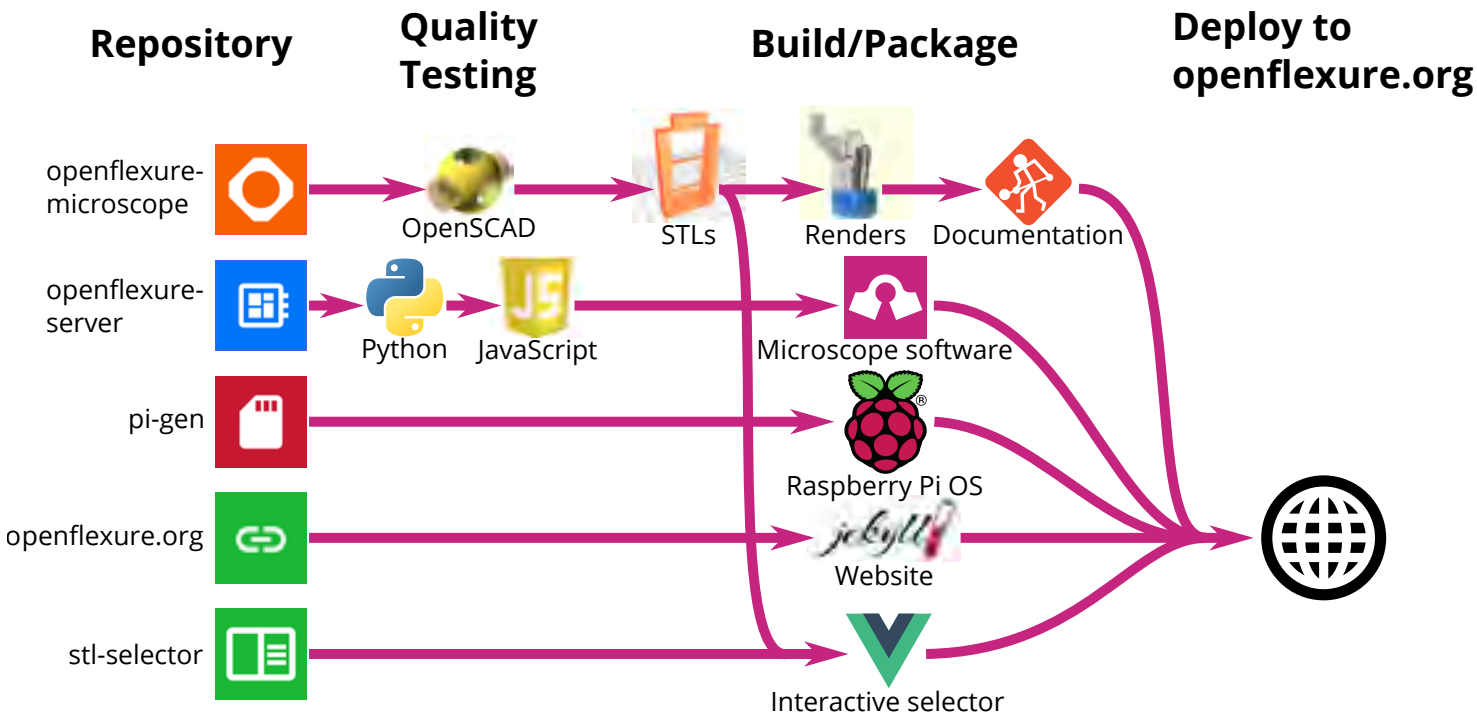
- Project management (Milestones, Assingees, etc)
- Issues (Actionable items)
- Version controlled/auditable minutes



- Version tracking
- Merge requests discussion and review
- Display bundled documentation

- Create issues/incident report
- Discuss open merge requests

Open toolchains in practice: The OpenFlexure Toolchain



Open toolchains in practice: The OpenFlexure Toolchain

Open toolchains in practice: The OpenFlexure Toolchain

Assemble the actuators

There is one "actuator column" for each of the three axes of the OpenFlexure Microscope stage. These allow you to move the sample in X and Y, or focus the microscope by moving in Z.

For this section you will need:

Printed Parts

- 3 feet - Each actuator has its own labelled foot
- 3 large gears

Printed Tools

- 1 band tool
- 1 band tool cover
- 1 nut tool

Sub-Assemblies

- 1 prepared main body

Consumables

- 3 drops of light oil - Don't skip this or you will damage the screws

Mechanical Components

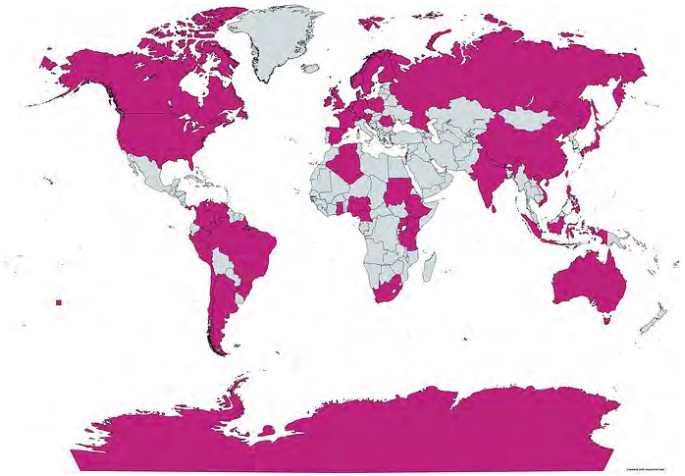
- 3 M3 brass nut
- 6 M3 stainless steel washers
- 3 M3x25mm stainless steel hex bolt
- 3 Viton O-ring (30mmx2mm) - "Viton band"

Acknowledgments

OpenFlexure team:

Our clinical collaborators (Catherine Mkindi, Joram Mduda, Daniel Rosen)

And our growing community



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Open Science