



# Successful Open Source in Research Projects

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# Successful Open Source in **Research Projects**



Horizon Europe has a budget of EUR 95.5 billion for the period from 2021-2027.

The ambitious EU research and innovation framework programme (2021-2027)

 fuel EU's <b>scientific and technological excellence</b> and the strengthen the European Research Area (ERA) <b>Science &amp; technology</b>	 tackle policy priorities, including <b>green and digital transitions</b> and Sustainable Development Goals <b>Society</b>	 boost Europe's <b>innovation uptake, competitiveness and jobs</b> <b>Economy</b>
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European Commission, Directorate-General for Research and Innovation, *Horizon Europe, budget : Horizon Europe - the most ambitious EU research & innovation programme ever*, Publications Office of the European Union, 2021, <https://data.europa.eu/doi/10.2777/202859>

[https://research-and-innovation.ec.europa.eu/system/files/2022-06/ec\\_rtd\\_he-investing-to-shape-our-future\\_0.pdf](https://research-and-innovation.ec.europa.eu/system/files/2022-06/ec_rtd_he-investing-to-shape-our-future_0.pdf)



Bundesministerium für Bildung und Forschung



Bundesministerium für Wirtschaft und Klimaschutz



From small to large consortia;  
from 6 partners to over 70  
partners

# Successful **Open Source** in Research Projects

## Free and Open Source Software (FOSS)

<b>F0</b>	The freedom to <b>run</b> the program <b>as you wish</b> , for any purpose
<b>F1</b>	The freedom to <b>study</b> how the program works, and <b>change</b> it so it does your computing as you wish
<b>F2</b>	The freedom to <b>redistribute</b> copies so you can help others
<b>F3</b>	The freedom to <b>distribute</b> copies of your modified versions to others

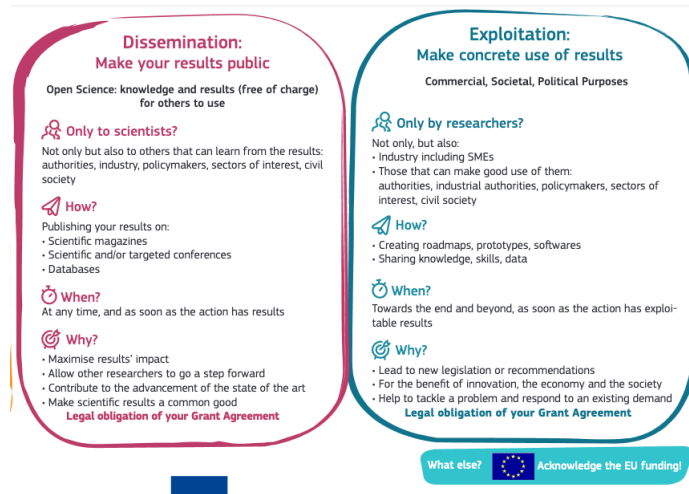


Free as in “free speech” not as in “free beer”

<https://www.gnu.org/philosophy/free-sw.en.html>  
<https://opensource.org/osd>

# Successful Open Source in Research Projects

## KEY IMPACT PATHWAYS



After the project we will...

# **Successful** Open Source in Research Projects

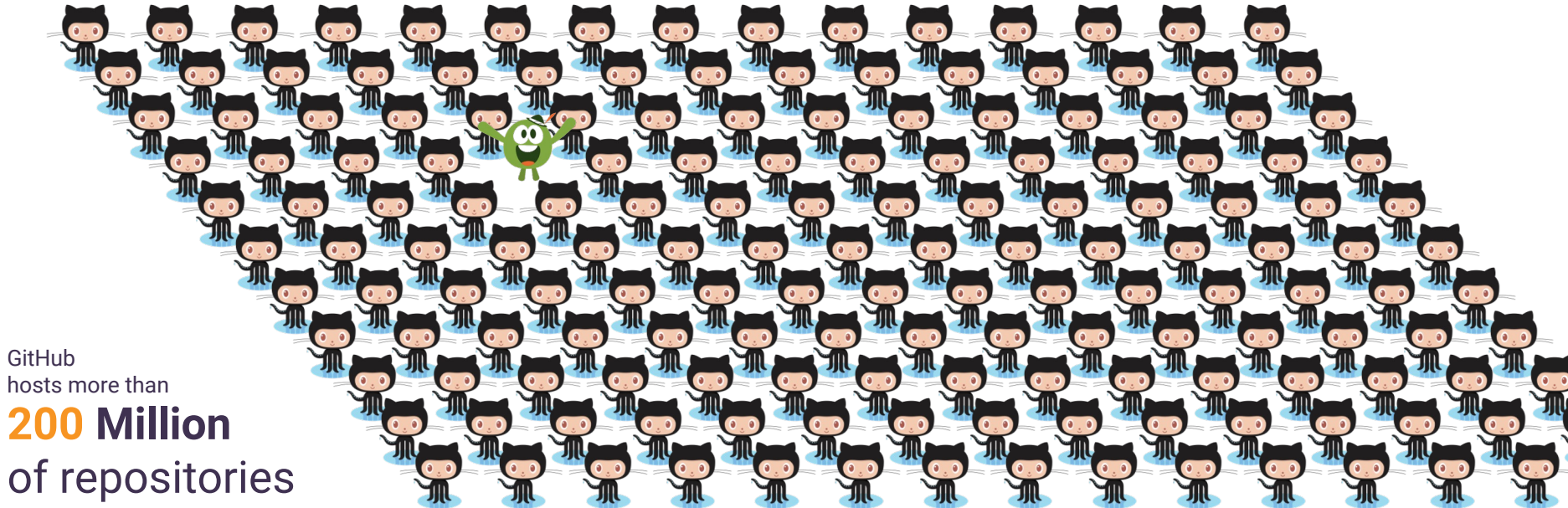
**Adoption**

**Community**

OK, FINE, THEN LET'S **PUBLISH** SOME CODE ON GITHUB  
TOWARDS THE **END OF THE PROJECT**

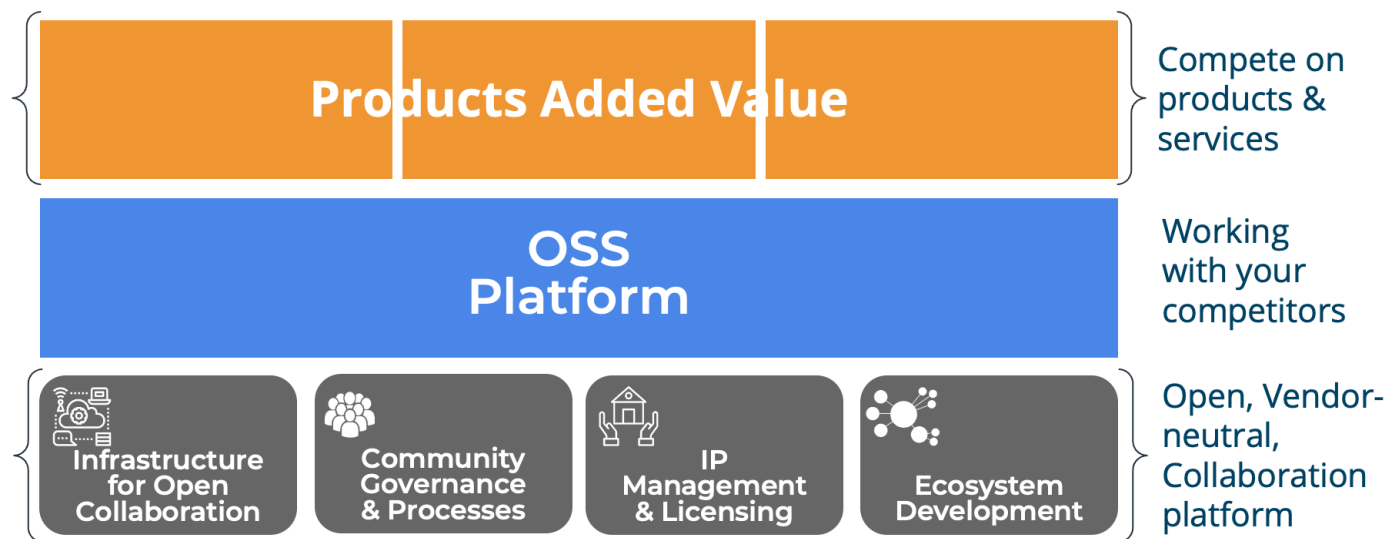
"[...] a significant number of projects [on GitHub] die in the first year of existence with the survival rate decreasing year after year. In fact, the probability of surviving longer than five years is less than 50%"\*

\*Ait, A., Izquierdo, J. L. C., & Cabot, J. (2022). An Empirical Study on the Survival Rate of GitHub Projects. <https://ieeexplore.ieee.org/document/9796216/>




GitHub  
hosts more than  
**200 Million**  
of repositories

# Eclipse Foundation model for vendor-neutral open collaboration







The box of  
hidden agendas

## Research Projects are different!

OSS Project

Proprietary Product  
DON'T OPEN!

No clue why we are in  
this project

We just want the  
money

Open Source is awesome!

Let's develop something  
great and useful together!

# Open Source Strategy for Research Projects

Open Source Strategy

Keep track of the open source landscape of the project

Identify what partners bring into the project

Identify open source assets/output

Create an environment that allows doing proper open source

Develop in the open from the beginning (Infra, CI/CD)

Take care of IP and licensing

Plan for community building, sustainability and long-term governance

Target relevant open source communities

**Further reading:** <https://newsroom.eclipse.org/eclipse-newsletter/2022/november/how-research-projects-can-survive-and-thrive-open-source>

# Identify Partners Background

- > Know where you are!
- > Usually done anyway, but make sure to not miss the open source parts
- > Try to start it in proposal phase



\*It may sound like a trivial task, but it is an important task and will help to kick off important discussion EARLY!

<b>Name</b>	Name of the Tool, Software- or Hardware Project
<b>Short description</b>	BRIEF description of its purpose (general)
<b>Role in the Project</b>	What are your plans for applying it in the project?  In which Task(s) will this happen?
<b>Extension</b>	Do you plan to extend it in the scope of the project?  If Yes, can you briefly describe in which way? E.g. what will be the main features, interfaces, extensions you plan to do?
<b>Open Source or Proprietary</b>	Is it proprietary or open source?
<b>License</b>	Under which License?
<b>Community and Standardization</b>	Is the development embedded in any kind of community? Think open source communities, standardization bodies, and the like.
<b>Collaborations</b>	Are other partners involved in the development (inside and outside of the project)?
<b>Link to repository (if any)</b>	
<b>Link to website (if any)</b>	

# Identify Open Source Output/Assets

- > Every Research Project is different in terms of output:

Full-fledged  
Platform

Specific Tools

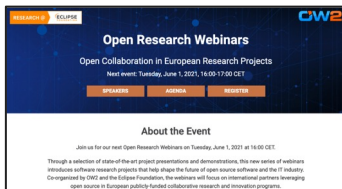
Extension

Application

- > But in any case it needs to be defined (Architecture & Exploitation)
- > **Avoid:** A “core” open source platform that will not work without a proprietary part/library!

# Target relevant open source communities

- > Building up a community from scratch is a difficult, long-term, and cost-intensive task!
- > → Don't reinvent the wheel!



# Take care of IP and Licensing

**Important!** And can become quite complex.

- Education, Training & Awareness
- Tool support (e.g. <https://github.com/eclipse/dash-licenses>, <https://github.com/oss-review-toolkit>)
- TRUST!

Agree on the (or at least a set of) Licenses for your asset(s)



dependencies

**Compatibility!**



# Developing in the open right from the start!

No, no, the code is not ready to be seen by others...

Just let me finish the documentation first...

**OK, BUT...**

But my code is very experimental...

Can't we start off in a private repo first?

Well, we are not going to share anything anyhow!

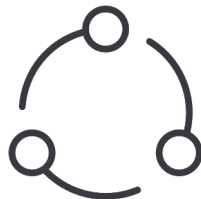
Remember our little friend?



Let's face it, probably the world is not waiting to review the code of our research project...

# Plan for long-term sustainability and governance

Open Source Foundations enable  
**vendor-neutral**  
**open collaboration**



Not controlled by a single company  
Need for a trusted third party



# Plan for long-term sustainability and governance

**c|net** BEST PRODUCTS ▾ REVIEWS ▾ NEWS ▾ VIDEO ▾ HOW TO ▾ SMART HOME ▾ CARS ▾

## Google cuts off Huawei phones from future Android updates

The move follows President Trump's executive order that effectively bans Huawei in the US. Chipmakers will reportedly stop selling to Huawei, too.

**Natalie Weinstein** May 20, 2019 4:45 AM PDT

<https://www.cnet.com/news/google-reportedly-cuts-off-huawei-phones-from-future-android-updates/>

**GeekWire** NEWS ▾ JOBS ▾ EVENTS ▾ RESOURCES ▾ ABOUT ▾

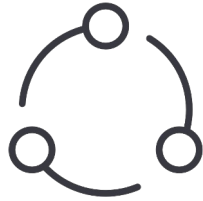
Newsletter sign up

## Cloud Tech

### MongoDB's licensing changes led Red Hat to drop the database from the latest version of its server OS

BY TOM KRAZIT on January 16, 2019 at 1:36 pm

<https://www.geekwire.com/2019/mongodb-licensing-changes-led-red-hat-drop-database-latest-version-server-os/>



**mongoDB**  
**Server Side Public License**

The SSPL has not been approved by the OSI.

<https://www.mongodb.com/licensing/server-side-public-license/faq>

Not controlled by a single company  
Need for a trusted third party

**SUCCESSFUL OPEN SOURCE IS NOT A BY-PRODUCT**  
**IT REQUIRES A STRATEGY, PLAN, TASKS, AND EFFORTS**

LET'S LOOK AT SOME **EXAMPLES**

## Reference Architecture and Open Platform for the fourth Industrial Revolution



### ASSET ADMINISTRATION SHELLS

Asset Administration Shells (AAS) are the foundation of the Digital Twin with unified interfaces for all kinds of manufacturing assets. Eclipse BaSys supports type 1, 2 and 3 AAS that enable static data, live data, and active negotiations.



### LOT SIZE 1 PRODUCTION

Eclipse BaSys provides basic MES functionality to enable service oriented architectures (SOA) for production systems. Thus, the efficient production of lot size one becomes possible.



### CONNECTIVITY

Connect OPC-UA, MQTT, and fieldbus devices with our data provider components. Integrate MES and ERP systems with your production systems. Use our components to secure your machine to machine communication.



### INDUSTRY 4.0 INFRASTRUCTURE

Eclipse BaSys implements all important Industry 4.0 infrastructure components including the the AAS registry, AAS and AAS sub model server components, as well as data provider components. Integrate data bases, backups, asset management, load balancers, and S3 storage, if necessary.



### DATA CENTER INTEGRATION

Eclipse BaSys scales with your requirements. We deliver Industry 4.0 as docker components that can be deployed in your IT. Whether you want to setup BaSys on a PC server or integrate with your data center infrastructure, the choice is yours.



### INTELLIGENCE

Use our pre-packaged analysis, visualization, and automation components to start your Industry 4.0 experience today!





2016 - 2022



## Community & Sustainability!



<https://www.eclipse.org/basyx/>

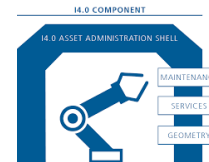
### Reviews:

Name	Date
2023.01 Progress/Graduation Review	2023-01-11
2024.01 Progress Review	2023-01-10
1.1.0 (JAVA) Release Review	2022-03-31
Restructuring Review	2022-03-16
1.0.0 (JAVA) Release Review	2021-03-18
Creation Review	2017-09-20

Graduation



1.0 Release



### RELATED PROJECTS

Project Hierarchy:

- » Eclipse Digital Twin
- » Eclipse AAS Model for Java
- » Eclipse AAS Web Client
- » Eclipse AASX Package Explorer
- » Eclipse BaSyx™
- » Eclipse Semantic Modeling Fr...
- » Eclipse Service Lifecycle Man...

## Cloud IDE

The SmartCLIDE project will enable organizations on the path to digitalization to accelerate the creation and adoption of Cloud solutions. The innovative smart cloud-native development environment will support creators of cloud services in the discovery, creation, composition, testing, and deployment of full-stack data-centered services and applications in the cloud.



<https://smartclide.eu/>

## Community: Eclipse Cloud DevTools Working Group



### THE COMMUNITY FOR INDUSTRY-BEST OPEN SOURCE CLOUD DEVELOPMENT TOOLS

The Eclipse Cloud DevTools Working Group provides a vendor-neutral ecosystem of open-source projects focused on defining, implementing and promoting best-in-class web and cloud-based development tools.



## COMMUNITY



## PROJECT



OpenSmartCLIDE  
Created 2022-10-05

 **THEIA**

An Open, Flexible and Extensible  
Cloud & Desktop IDE Platform

## PROJECT

The Eclipse OpenSmartCLIDE is based on Eclipse Theia, which provides all of the tools necessary for development. Theia consists of a rich interface with a vast range of features that accelerate deployment of cloud services, improve their quality, and expand the skills of novice and experienced developers.

<http://eclipse.org/opensmartclide>

<https://projects.eclipse.org/projects/ecl.opensmartclide>



ARROWHEAD



ARROWHEAD  
TOOLS



2019 - 2022

<https://arrowhead.eu/>

## Integration Platform for Systems of Systems

Our vision is to enable collaborative automation by networked embedded devices. The grand challenges are enabling the interoperability and integrability of services provided by almost any device.

- Provide a technical framework adapted in terms of functions and performances
- Propose solutions for integration with legacy systems
- Implement and evaluate the cooperative automation through real experimentations in applicative domains: electro-mobility, smart buildings, infrastructures and smart cities, industrial production, energy production and energy virtual market

## 70+ partners from 18 countries!

The Arrowhead Tools project is a joint effort of 18 countries, proudly coordinated by Luleå university of Technology.





2019 - 2022

## Eclipse Arrowhead™

A framework and implementation platform for SoS, IoT and OT integration



<https://www.arrowhead.eu/eclipse-arrowhead>  
<https://projects.eclipse.org/projects/iot.arrowhead>

Releases:	
Name	Date
4.6.0	2022-09-21
4.5.0	2022-06-28
4.4.0	2021-11-03
4.3.0	2021-03-22

Reviews:	
Name	Date
4.3.0 Release Review	2021-03-25
Creation Review	2020-05-20

## APPSTACLE

open standard APplication Platform for carS and TrAnspotation vehiCLEs

APPSTACLE

21  
partners



4  
countries



ITEA 3 Call 2



Smart mobility

Oct 2016 - Dec 2019

Today automotive software-intensive systems are developed in silos by each car manufacturer or original equipment manufacturer (OEM) in-house. This approach cannot meet the long-term challenges of the industry. One solution is to establish a standard **car-to-cloud connection**, open for external applications and the use of open source software wherever possible without compromising safety and security.

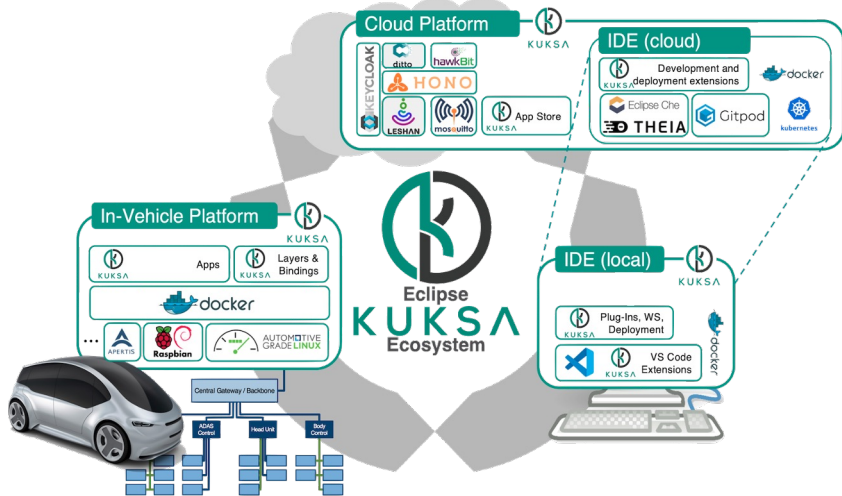
<https://itea4.org/project/appstacle.html>

Finland			
 Ericsson Finland	 Haltian Oy Finland	 Link Motion Finland	 Tieto Finland Oy Finland
 University of Oulu Finland			
Germany			
 BHTC Germany	 Bosch ID GmbH Germany	 Dortmund University of Applied Sciences and Arts Germany	 Eclipse Foundation Europe GmbH Germany
 Expleo Germany GmbH Germany	 Fraunhofer EMT Germany	 Robert Bosch GmbH Germany	 Infiniti GmbH Germany
 University of Paderborn Germany			
Netherlands			
 Eindhoven University of Technology Netherlands	 Fore Scout Technologies B.V. Netherlands	 NXP Semiconductors Netherlands	 T Technology Netherlands
Türkiye			
 KagSystem Turkey	 Netas Telekomünikasyon A.Ş. Turkey	 Otokar Otomotiv ve Savunma Sanayi A.Ş. Turkey	

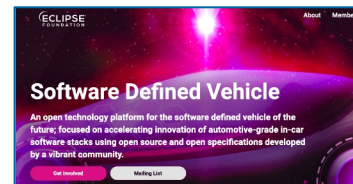
## COMMUNITY!

### Eclipse KUKSA™

Created 2017-12-06



<https://sdv.eclipse.org/>



#### Members

Join leading organizations that are joining forces on the non-differentiating parts, thus decreasing time-to-market, sharing best practices, and overcoming the war for talent.



<https://eclipse.org/kuksa>












<https://projects.eclipse.org/projects/automotive.kuksa/>

**AT THE END OF THE DAY IT IS ALL ABOUT  
THE PEOPLE**

# Research @ Eclipse Foundation

- > We are partner in Research Projects since 2013
- > We help consortia to do successful open source
- > <https://www.eclipse.org/research/>

We are currently involved in these projects:

 Cognitive Decentralised Edge Cloud Orchestration	 DATA Monetization, Interoperability, Trading & Exchange	 Together for RISC-V Technology and ApplicationS	 High Performance, Edge And Cloud computing	 multi-purpoSe Physical-cyber Agri-forest Drones Ecosystem for governance and environmental observation	
 Next Generation Meta Operating System	 A lightweight software stack and synergetic meta- orchestration framework for the next generation compute continuum	 Building the European Cloud, Edge & IoT Continuum for business and research	 Towards safe and secure distributed cyber-physical systems	 The Industrie 4.0 Operating System	 Smart Cloud IDE and Big Data Solutions



Open Source  
is a **Journey**,  
not a  
destination

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[eclipse.org/research](https://eclipse.org/research)