Building Better Together: How Open Source Models Encourage Collaborative Innovation in Engineering

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Current:

- **Control System Engineer – Beamlines (BESSY II - Helmholtz-Zentrum Berlin, Germany)**
  - EPICS Integration
  - Bluesky Integration
  - Deployment Systems and Workflows

Previous:

- **Instrumentation and Control Engineer (Fusion 4 Energy *(ITER Project)*– Barcelona, Spain)**
  - Real-time software – Fast Controllers
  - OPC-UA / EPICS Integration
  - PLC Integration and QA

- **Control System Engineer – Accelerator (European Spallation Source ERIC – Lund, Sweden)**
  - EPICS Integration
  - PLC Integration
  - Deployment Systems

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SUMMARY

- **OpenSource : A Broad Definition**

- **OpenSource: Why?**

- **Key Characteristics and misconceptions**

- **Challenges**

- **Open Source Everything**

- **Open Source Collaboration**

- **Conclusion**

OPENSOURCE : A BROAD DEFINITION

- **Open source** refers to a **collaborative** approach where knowledge, designs, processes, or data are made publicly accessible for modification, redistribution, and improvement. It's a philosophy of **sharing** and **cooperation** that extends beyond software development to encompass various engineering disciplines.

OPENSOURCE : A BROAD DEFINITION

- The term originated in the context of software development to designate a specific approach to creating computer programs. Today, however, "**open source**" designates a broader set of values—what we call "**the open source way**." Open source projects, products, or initiatives embrace and celebrate principles of open exchange, collaborative participation, rapid prototyping, transparency, meritocracy, and **community-oriented** development. *[Opensource.com]*

- Imagine you're building a *LEGO* spaceship with your friends. Open source is like sharing your spaceship design with other kids so they can see how you built it, make it better, or even build their own spaceship based on your ideas. It's like **sharing the fun** and making it even cooler for everyone! *[ChatGPT explaining Opensource to a 5-year old]*

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OPENSOURCE : WHY?

- Open source is about many minds converging to establish a technical "**superbrain**" that can outpace a seemingly never-ending onslaught of problems.

- Maintaining an open source project sharpens skills through public accountability. The need to justify choices and address **community feedback** promotes **best practices**.

- By accessing a vast array **of free or low-cost** open source projects, engineers can **test ideas quickly**, learn from others' solutions, and enrich the collective body of knowledge.

- Benefit from **different approaches** and solutions.

- Build **strong relationships** with other engineers and organizations.

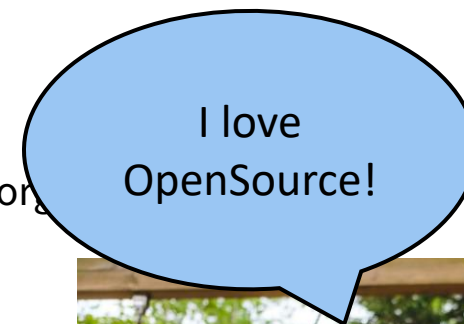HZB Helmholtz Zentrum Berlin

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- Imagine sharing your favorite toy car with all your friends. It's like showing them how to build a super cool race track! And guess what? Your friends can share their race track ideas with you too. It's like learning new tricks to **make your car go even faster**! *[ChatGPT explaining to another 5-year old why choosing Opensource is a good idea]*

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I love OpenSource!

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KEY CHARACTERISTICS

- **Accessibility:** Engineering designs, data, or processes are **freely available** for public use. The license shall not restrict any party from selling or giving away the components of a project.

- **Collaboration**: Multiple individuals or organizations can **contribute** to the development and improvement of the shared resources. The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original project.

- **Transparency:** The underlying principles and methodologies are openly shared and documented. **No Discrimination** Against Persons or Groups or against Fields of Endeavor.

- **Innovation:** By sharing knowledge and resources, open source fosters **creativity** and problem-solving.

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COMMON MISCONCEPTIONS

- **Open Source is free:** Open source software does not necessarily mean that executable software is given away for free. It does, however, mean that **its source code** is available for free. *[redhat.com]*
Converting the source code into something runnable and stable requires expertise, resources and time, which aren't free.

- **Open source has no support:** while not all open source projects offer a department dedicated specifically to customer support, a vast amount of developers of open source projects are directly accessible. When asked nicely, **most will offer help** debugging a problem with the software or answering questions about how to correctly use the tool. *[Opensource.com]*

- **Open source does not generate business revenue:** While it may be extremely difficult to profit directly from the sale of an open source product, many companies have been successful providing **consulting and support** for popular open source products. *[Opensource.com]*

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When I was 5 years old I had a lot of misconceptions about OpenSource...

CHALLENGES

- **More contributors = more risk:** When a community grows there are more developers contributing to the project, increasing the risk of problematic components/designs. There is a very real need to establish some guidelines for all contributors to follow and to implement peer review.

- **Code Standards and common license:** Ensuring that every submission looks similar and adheres to a set of rules is a key value. Defining Standards and requiring acceptance of a common license, is a must have in open source projects.

- **Shared Vision:** If a community is grown organically and carefully around the shared vision and goals of the organization then the community becomes much stronger than even a closed source corporation.

- **Slow Progress:** *"too many cooks spoil the soup"*. Coordination and decision-making processes are essential steps in a shared project.
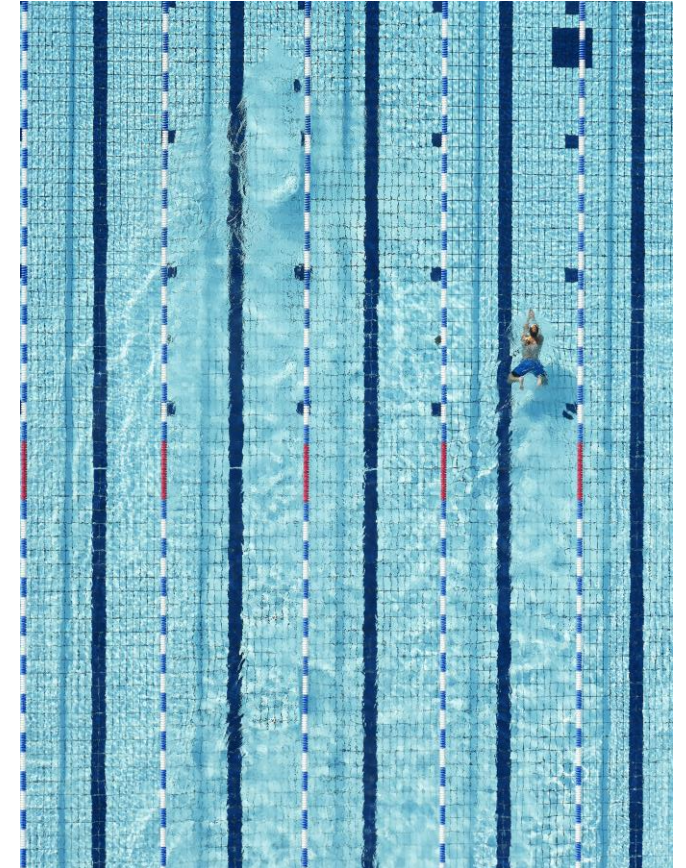
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OPEN SOURCE EVERYTHING

- **Open Source Software:** computer software that is released under a license in which the copyright holder grants users the rights to use, study, change, and distribute the software and its source code to anyone and for any purpose. *[Wikipedia.org]*

- **Open Source Hardware:** Hardware design (i.e. mechanical drawings, schematics, bills of material, PCB layout data, HDL source code and integrated circuit layout data), in addition to the software that drives the hardware, are all released under free/libre terms. *[Wikipedia.org]*

- **Open Data:** data that is openly accessible, exploitable, editable and shared by anyone for any purpose. *[Wikipedia.org]*

- **Open Standard:** standard that is openly accessible and usable by anyone. It is also a common prerequisite that open standards use an open license that provides for extensibility. *[Wikipedia.org]*

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Firefox

Linux

android

Python

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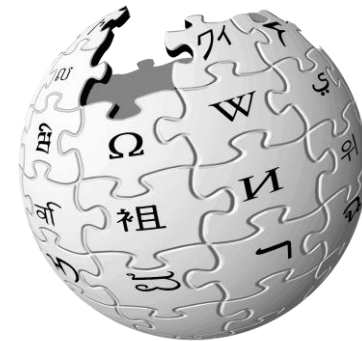
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OPEN SOURCE COLLABORATION

- **Open collaboration** refers to any "system of innovation or production that relies on **goal-oriented** yet loosely **coordinated** participants who cooperate voluntarily to create a product (or service) of economic value, which is made freely available to contributors and noncontributors alike." *[Wikipedia.org]*

- Open collaboration are based on three principles of **egalitarianism**, **meritocracy**, and **self-organization**.

Wikipedia

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OPEN SOURCE COLLABORATION: GOVERNANCE MODELS

- The rules and customs that define who gets to do what (and how they are supposed to do it) is called a project's "**governance model.**"

  - **"Do-ocracy":** those who do the work are those who make the decisions.
  - **Founder-leader:** the individual or group who started the project also administers the project, establishes its vision, and controls permissions to merge code into it.
  - **Self-appointing council:** a number of leadership groups govern various aspects of a project. Such groups may have names like "*steering committee*," "*technical operating committee*", or "*board of directors*."
  - **Electoral:** governance is conducted through elections. People vote for candidates to fill various project roles, or conduct similar electoral processes to ratify or update project policies and procedures.
  - **Foundation-baked:** the project is managed by a non-profit or trade association. Doing this ensures that a single project participant does not exert exclusive control of key project resources.
  - **Corporate-baked:** individual companies or industry consortia may choose to distribute software under the terms of an open source license as a way of reaching potential developers and users—even if they do not accept project contributions from those audiences.

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CONCLUSION

- Open source fosters collaboration, innovation, and community. By sharing ideas, we can **build better together**.

- Open source is a powerful tool for learning, teaching, and problem-solving. It's a platform for **growth** and development.

- Without Open Source, technology wouldn't be as **accessible** as we know it today. The price of education would cost a lot more than now. The global knowledge of humanity would be smaller and our overall progress, not just in software, would be much slower.

- The **freedom** we get from Open Source projects is what's driving our global progress. It is what allows us to enjoy the conveniences we currently have for practically no cost. Its what helps us learn, innovate and collaborate with others. Whenever you contribute to anything Open Source, understand that you are contributing to **something larger**. Think of it as serving humanity and making it **better**.

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- So, open source is like having a big playground where everyone shares their toys and ideas. You can play with other kids' toys, and they can play with yours. It's like a giant, fun party where everyone helps each other build amazing things! *[ChatGPT summarizing this presentation to a 5-year old kid]*

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