



# An Introduction to Software Licensing

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See slide 2 for license details

# License, Citation and Acknowledgements

## License and Citation

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- **The requested citation the overall tutorial is: David E. Bernholdt, Anshu Dubey, Todd Gamblin, Jared O’Neal, and Boyana R. Norris, Software Productivity and Sustainability track, in Argonne Training Program on Extreme-Scale Computing, St. Charles, Illinois, 2022. DOI: [10.6084/m9.figshare.20416215](https://doi.org/10.6084/m9.figshare.20416215).**
- Individual modules may be cited as *Speaker, Module Title*, in Better Scientific Software tutorial, ISC, 2022 ...

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# Bottom Line Up Front

How you choose to license your software should be viewed as a tool to help accomplish your goals for that software.

There is no universal “right answer”!

The answer may not be your decision.

This tutorial will present common terminology, and examples of some of the considerations that might go into choosing a license.

The intent is to get you thinking, not to give you answers.

This is not legal advice. Consult with true experts before making any consequential decisions!

# Some Terminology and Background



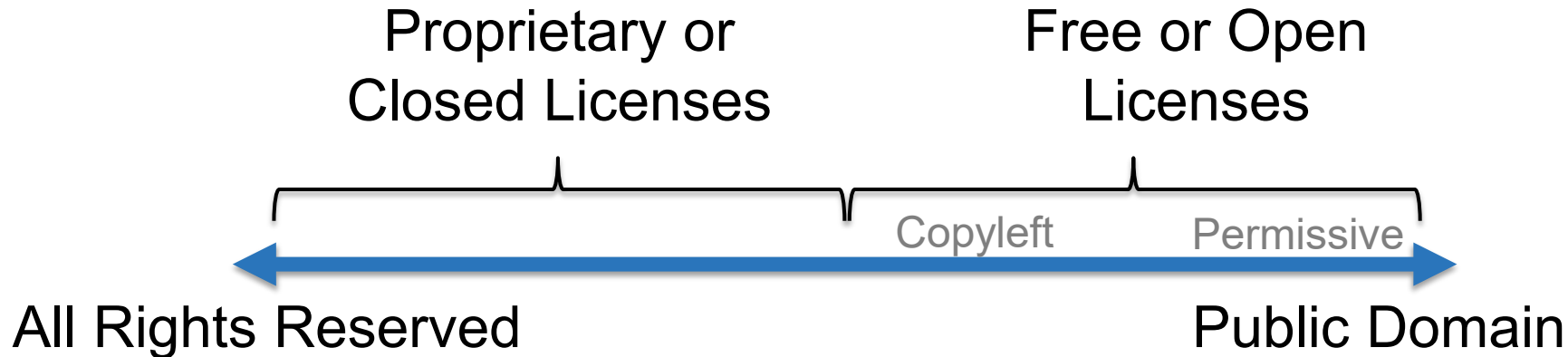
# Copyright, Patents, Trademarks, and Licenses

- **Copyright** grants the creator of an **original work** exclusive rights to its use and distribution, including limits on derivative works
- A **patent** grants the inventor of **something new, useful, and non-obvious** the rights to its production, use, and distribution
- A **trademark** is a **sign, design, or expression** which identifies products or services from a particular source, as distinguished from other sources
- **Licenses** are used to transfer (selected) rights in a work, invention, or mark from one party to another
  - Software licenses are mostly about copyright, but can contain clauses on patents and trademarks too

# Your Software Starts Out Copyrighted

- Under the law, the software you write is subject to **copyright on creation**
  - You don't have to do anything special to claim copyright
  - Unless you specify some license, all rights are reserved to the owner of the copyright
- The copyright owner may be **you, or your employer**
  - “Work for hire” (i.e., as part of your job) is probably owned by your employer. Employment contracts often make IP rights explicit.
  - Question 1: Who owns the rights in the work you create?
  - Homework: Find out!
  - If your employer owns the copyright, you probably have to get formal permission to license and distribute your software
- Exception: Works created by the US government cannot be copyrighted
  - They are considered to be in the public domain
    - Comment: Originally to ensure public access to the US legal code

# The Licensing Spectrum



## Free vs Open Source?

- “Free” in licensing discussions should refer strictly to “freedom” (to do certain things with the software)
- Often gets conflated with “free as in beer”, muddling the discussion. Hence some prefer term “open source”

## Major names in Free/Open Source Software:

- Free Software Foundation (FSF) <http://fsf.org/licensing>
- Open Source Initiative (OSI) <http://opensource.org>

**Common misconception:**  
Nothing in the definition of free or open source software prevents you from making money from it! (more later)

# Defining Free Software: The Four Freedoms

*From the Free Software Foundation*

- The freedom to **run the program** for any purpose
- The freedom to **study how the program works**, and **change it** so it does your computing as you wish
  - **Access to the source code** is a precondition for this
- The freedom to **redistribute copies** so you can help your neighbor
- The freedom to **distribute copies of your modified versions** to others. By doing this you can give the whole community a chance to benefit from your changes
  - **Access to the source code** is a precondition for this

*The OSI has a definition which amounts to the same thing, for most purposes*



# Permissive vs Copyleft OS Licenses

## Permissive

- Licensee can distribute derivative works as they see fit
  - Relicensing of derivatives is allowed
  - Including proprietary licenses
- Examples
  - Apache License
  - MIT License
  - BSD License

## Copyleft

- Licensee must distribute derivative works as open source
  - Also referred to as “restrictive” or “viral”
- Examples
  - GPL (v2 and v3)
  - LGPL

**Note:** Derived works may be held private and never released

# What is a Derivative Work?

- *A derivative work is an expressive creation that includes major copyright-protected elements of a previously created first work (Wikipedia)*
- Basically: modifications to someone else's software
- But what about linking to a library? (Statically vs dynamically?) Interacting via pipes? Use as a component in a coupled multiphysics application?
  - Opinions differ
  - FSF (GPL) considers everything in a single executable to be a derived work (source of “viral” label)
  - LGPL created for libraries – says linking not considered derived work
  - Matters less for permissive licenses
  - Leads to concerns over “compatibility” in combining software under different licenses (more later)

# Test: Is this an Open Source License?

## (A real-world example)

In order to acquire access to the code sources, the recipient agrees:

1. to compile/use the XYZZY source code AS IS without modification; users however are welcome to request changes, or to contribute modifications subject to approval of the authors;
2. if the copy of the XYZZY downloaded by the authorized user is made available to third parties, to ensure that the user agreement is followed by the third parties;
3. to send a one-time email to [xyzzy@example.com](mailto:xyzzy@example.com) describing planned research using that module
4. prior to publication, to email a draft of the article/letter/note to [xyzzy@example.com](mailto:xyzzy@example.com)
5. to include in published results or presentations the proper code name(s) and appropriate references.

## Answer: Is this an Open Source License? No (A real-world example)

In order to acquire access to the code sources, the recipient agrees:

1. to compile/use the XYZZY source code AS IS without modification; users however are welcome to request changes, or to contribute modifications subject to approval of the authors;
2. if the copy of the XYZZY downloaded by the authorized user is made available to third parties, to ensure that the user agreement is followed by the third parties;

**This violates the freedom of being able to distribute copies of your modified version of the code to others**

Perhaps they want to impose some measure of “quality control” over modifications? Maybe they’ve had problems in the past with users distributing modified code with errors that are believed to reflect poorly on the original code?

Possible alternative: Some open source licenses include a requirement that derivatives must be clearly distinguished from the original (e.g., different name)

# Choosing a License



# Considerations in Choosing a License

- What rights do you want to retain or grant?
  - Who can use the program? (proprietary vs open)
  - Can users see the source code? (proprietary vs open)
  - Can users modify the source code? (proprietary vs open)
  - Can the users redistribute original or modified code? (proprietary vs open)
  - Can modified code be relicensed? (permissive vs copyleft)
- Compatibility with software under other licenses
  - Permissive licenses have fewer issues
  - <http://www.fsf.org/licensing/>
- Labeling of derived works
  - Derived works must be identified differently than original work
- Patent grant/retaliation
- Expectations of the community you want to engage?

***Use an existing  
free/open source  
license rather than  
inventing a new one!***

*FSF and OSI certify  
many existing licenses  
(~80) as meeting their  
criteria*

# Popular OSI-Approved Licenses

License	Type	GPL- Compatible	Patent Grant
Apache License 2.0	Permissive	v3,not v2	yes
BSD 2-Clause and 3-Clause licenses	Permissive	yes	silent
GNU General Public License (GPL) v3	Copyleft	yes	yes
GNU Library or "Lesser" General Public License (LGPL) v3	Weak Copyleft	yes	yes
MIT license (MIT)	Permissive	yes	silent
Mozilla Public License 2.0	Permissive	yes	yes
Common Development and Distribution License	Permissive	no	yes
Eclipse Public License 2.0	Weak Copyleft	yes	yes
Affero General Public License v3 ( <i>network use == distribution</i> )	Copyleft	yes	yes

# ChooseALicense.com (by GitHub)

- Primarily a decision-tree approach to helping you choose a license
- But backed by a repository with analysis of 30+ widely used licenses
- **The easiest way to access the whole list is to go to the “Appendix”**
  - <https://choosealicense.com/appendix/>
  - A portion of the Appendix is shown at left
- This is implemented in a GitHub repository with Jekyll, and open to pull requests!

License	Commercial use	Distribution	Modification	Patent use	Private use	Disclose source	License and copyright notice	Network use is distribution	Same license	State changes	Liability	Trademark use	Warranty
Academic Free License v3.0	●	●	●	●	●		●			●	●	●	●
GNU Affero General Public License v3.0	●	●	●	●	●	●	●	●	●	●	●		●
Apache License 2.0	●	●	●	●	●		●			●	●	●	●
Artistic License 2.0	●	●	●	●	●		●			●	●	●	●
BSD 2-Clause "Simplified" License	●	●	●		●		●				●		●
BSD 3-Clause Clear License	●	●	●	●	●		●				●		●
BSD 3-Clause "New" or "Revised" License	●	●	●		●		●				●		●
Boost Software License 1.0	●	●	●		●		●				●		●
Creative Commons Attribution 4.0 International	●	●	●	●	●		●			●	●	●	●
Creative Commons Attribution Share Alike 4.0 International	●	●	●	●	●		●		●	●	●	●	●
Creative Commons Zero v1.0 Universal	●	●	●	●	●						●	●	●
Educational Community License v2.0	●	●	●	●	●		●			●	●	●	●
Eclipse Public License 1.0	●	●	●	●	●	●	●		●		●		●
Eclipse Public License 2.0	●	●	●	●	●	●	●		●		●		●
European Union Public License 1.1	●	●	●	●	●	●	●	●	●	●	●	●	●
European Union Public License 1.2	●	●	●	●	●	●	●	●	●	●	●	●	●
GNU General Public License v2.0	●	●	●		●	●	●		●	●	●		●
GNU General Public License v3.0	●	●	●	●	●	●	●		●	●	●		●
ISC License	●	●	●		●		●				●		●
GNU Lesser General Public License v2.1	●	●	●		●	●	●		●	●	●		●
GNU Lesser General Public License v3.0	●	●	●	●	●	●	●		●	●	●		●
LaTeX Project Public License v1.3c	●	●	●		●	●	●			●	●		●
MIT License	●	●	●		●		●				●		●
Mozilla Public License 2.0	●	●	●	●	●	●	●		●		●	●	●
Microsoft Public License	●	●	●	●	●		●					●	●
Microsoft Reciprocal License	●	●	●	●	●	●	●		●			●	●
University of Illinois/NCSA Open Source License	●	●	●		●		●				●		●
SIL Open Font License 1.1	●	●	●		●		●		●		●		●
Open Software License 3.0	●	●	●	●	●	●	●	●	●	●	●	●	●
PostgreSQL License	●	●	●		●		●				●		●
The Unlicense	●	●	●		●						●		●
Universal Permissive License v1.0	●	●	●	●	●		●				●		●
Do What The F*ck You Want To Public License	●	●	●		●								
zlib License	●	●	●		●		●			●	●		●



# Consideration: Software Business Models

Approach	Proprietary	Copyleft	Permissive
<b>Sell the software</b>	yes	yes	yes
<b>“Fremium” or “dual licensing”</b> allows free use by some, paid by others	yes	yes	yes
<b>Relicense to proprietary</b>	n/a	no	yes
<b>Sell convenience</b> , e.g., packaging, installation media, pre-compiled executables	yes	yes	yes
<b>Sell professional services</b> around the software, e.g., training, technical support, consulting	yes	yes	yes
<b>Sell custom development services</b> , e.g., proprietary extensions, accelerated development	yes	yes	yes
<b>Sell software-as-a-service (SaaS)</b>	yes	yes	yes
<b>Sell the research</b>	yes	yes	yes

# Consideration: Don't Want Others to Profit from my Open Source Software

- A permissive license allows someone else to take derivatives proprietary
- A copyleft license will prevent that

## But there may be other considerations...

- What if you do want a commercial entity to use your software?
  - Exposure, broader distribution
- Copyleft is scary to many commercial entities
  - How far does the viral license reach into other parts of the product?
  - Legal opinions differ, no case law yet
    - Lawyers will tend toward a conservative answer: avoid copyleft software
    - Experience: some companies will not consider working with copyleft software
    - Experience: some companies consider staff working on copyleft software to be “contaminated” and will not allow them work on other software
- Even in non-commercial environments, copyleft may raise compatibility concerns

# The Software-as-a-Service Conundrum

- Many software-as-a-service (SaaS) products make extensive use of open source software
- Some software developers don't like the possibility that another company can trivially monetize (other people's) software by turning it into a SaaS product
  - It may compete with their own SaaS offerings
  - The SaaS provider can keep enhancements proprietary and while making the benefits available in the SaaS product
- Attempts to curb this via licensing result in licenses that are not open source
  - In some cases, key modules are changed to proprietary licenses, while others remain open
- See: <https://arstechnica.com/information-technology/2019/10/is-the-software-world-taking-too-much-from-the-open-source-community/>

# Consideration: Protecting my Intellectual Property

- If I make my source code freely available, then others can use the novel ideas embodied in it to “scoop” me
- Proprietary licenses (obviously) allow you to keep source private
- Open source licenses don’t require that you make derived works public, only that ***if*** you do, you make the source available
- Delay public release until you’ve had a reasonable chance to exploit the results of your work
  - Until initial papers are published
  - Fixed time period (e.g., one year)
    - A similar compromise is sometimes used in academic publishing: sponsor may want open access but allow publisher a proprietary exploitation period (often 1 year) before making it openly available

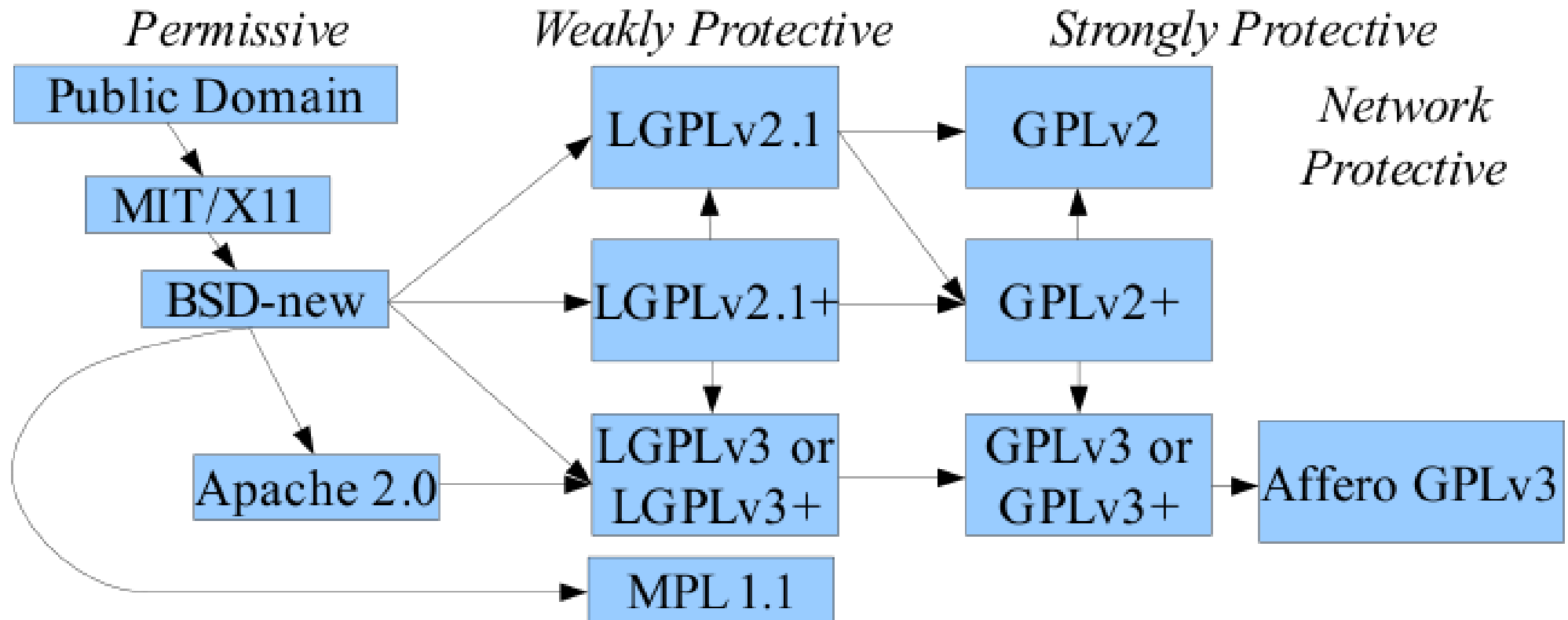
# Patent Clauses in Software Licenses

- Software patents can be a serious consideration today
  - Regardless of philosophical arguments for or against, software patents are a reality
  - If you're using a piece of software (even open source) that is covered by a patent and you don't have a license for the patent, you're infringing
  - Not being aware of a patent does not excuse the infringement
  - You can be sued for monetary damages
- Many common software licenses are silent on patents
  - Especially older ones (e.g., BSD, GPLv2)
- Some newer licenses do include patent clauses
  - Usually a royalty-free license to use patented content (e.g. Apache 2.0, GPLv3)
  - Some explicitly say that they do not grant any patent rights (e.g., BSD 3-Clause Clear)
  - Or retaliation clauses: “if you sue me for patent infringement, you can't use this software”

# License Compatibility

- In practice, most software is a **combined work** of some kind
  - Multiple packages with (potentially) different licenses (e.g. main package and dependencies)
  - Do the license terms allow the packages to be distributed (or even used) together?
  - Is the combined work considered a derived work?
- Different licenses have different concepts of what constitutes a derived work and how derivatives may or must be licensed
  - Example: strong copyleft considers linking to produce a derived work, and requires derivatives be distributed under the same license as the original
- There are different interpretations of what licenses are compatible
  - Little litigation so far
- Most significant concerns tend to be about distribution of software
  - Larger projects starting to pay more attention to his

# License Compatibility in Pictures



One view of license compatibility between common FOSS software licenses. The arrows denote a one directional compatibility, therefore better compatibility on the left side than on the right side.

By David A. Wheeler - <http://www.dwheeler.com/essays/floss-license-slide.html>, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=4106008> via [https://en.wikipedia.org/wiki/License\\_compatibility](https://en.wikipedia.org/wiki/License_compatibility)

# Strategies for Reducing License Compatibility Concerns

- Don't distribute other software packages as part of yours
  - Especially if you're distributing binaries
  - If you need to modify other software, try to upstream changes or ship only patches instead
- Consider the licenses of your immediate software ecosystem
  - Your dependencies
  - Other software yours is likely to be used with
  - Think about how your software interacts with other packages in the ecosystem
    - Recall earlier discussion of the different definitions of “derived work” for different licenses
- Consider the licensing practices of the community or target audience
- Permissive licenses tend to have fewer compatibility problems
- Consider relicensing your software
  - More on this coming up



# Considerations Favoring Open Source

- Challenges of managing and archiving the paperwork associated with proprietary licenses
- Explicit license agreements can inhibit (legal) use of software
- I want to support peer review and reproducibility in science
- My sponsor requires that I release my software as open source
- I believe that the results of publicly-funded research should be publicly available
- I want to build a self-sustaining community around my software

# A Few More Points About our Real-World Example

In order to acquire access to the code sources, the recipient agrees:

1. to compile/use the XYZZY source code AS IS without modification; users however are welcome to request changes, or to contribute modifications subject to approval of the authors;
2. if the copy of the XYZZY downloaded by the authorized user is made available to third parties, to ensure that the user agreement is followed by the third parties;
3. to send a one-time email to [xyzzy@example.com](mailto:xyzzy@example.com) describing planned research using that module
4. prior to publication, to email a draft of the article/letter/note to [xyzzy@example.com](mailto:xyzzy@example.com)
5. to include in published results or presentations the proper code name(s) and appropriate references.

# Why are these Clauses Included?

4. prior to publication, to email a draft of the article/letter/note to `xyzzzy@example.com`

An attempt to address prior experience with users misusing the code and producing publications with erroneous results, thus reflecting poorly on the code used to obtain them.

Creates a burden on the code owners.

Not sure how strongly they attempt to enforce this.

5. to include in published results or presentations the proper code name(s) and appropriate references.

A natural desire for the software to be credited in papers where it is used.

Does not violate free/open source software principles.

Some licenses require attribution, but usually only in source code.

- Creative Commons licenses can include an attribution clause (see later slide)

Possible alternative: CITATION file?



# Some Related Matters



# Software Licenses Can be Changed

- You may start out using one license for your code and later discover unanticipated problems
- Or maybe your goals change

## But changing licenses is not necessarily easy

- (Generally) each and every contributor to a code holds a copyright interest in it
- Each and every contributor must be contacted and agree to the relicensing
  - In practice, different institutions may have different ideas of “due diligence”
  - Keep good records of contributors; try to keep them current
- Contributor license agreements (CLAs) and contribution transfer agreements (CTAs) can simplify this
  - But present different challenges (see upcoming slide)

# Changing License Example #1

- Organization owns copyright for several software packages
  - Licensed LGPL
- Authorship agreements were signed at time copyright was asserted
- Several packages contained third-party source files
  - A variety of licenses
- Many packages received contributions from other authors since initial copyright assertion
- Many prospective (particularly industry) customers were wary of LGPL
  - Decision was made to relicense to BSD

# Changing License Example #1 (continued)

- Contributions were deemed to be substantive or “bug fix”
  - This was a distinction suggested by a lawyer, every situation will be different
- All third-party software was judged to have a compatible or incompatible license
- Most packages were eventually relicensed, a few were not
- A contributor agreement was adopted after this
  - Proved challenging in practice and is largely not used.
- Considered building an agreement into pull-request template
  - Not clear if that is enforceable
  - Often people do not have the ability to agree on behalf of their employer

## Changing License Example #2

- Another case of moving to a less restrictive license
- Effort was made to obtain agreement from all 400+ contributors
- This was successful, except one contributor had passed away
  - His contribution was removed from the code base
- This was a more careful and exhaustive effort than the first example
  - Not implying it is better or worse



# Accepting Code Contributions

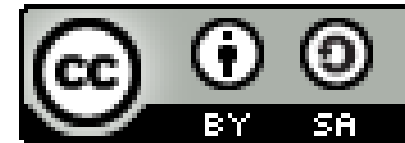
- Code contributions are implicitly offered under the current license
- Some projects require a contributor agreement
  - Contributor license agreement (CLA) defines the terms between the contributor and the maintainers of the software
  - Contributor transfer agreement (CTA) transfers copyright ownership from contributor to maintainers
  - Developer Certificate of Origin (DCO) has been proposed as an alternative to CLAs
    - Developer asserts that they have permission to submit the code. Not a signed legal contract
- Why?
  - Clarify or make explicit terms of contribution (awareness by contributor)
  - Obtain additional rights, e.g., relicensing, patents, etc.
  - Ensure “clear title” to make the contribution
- Why not?
  - Creates “barriers to entry” – may discourage potential contributors
  - Legal agreements that may require official review and signature
    - Experience: Lost funding for a project because lawyers wouldn’t agree to terms of a CLA
- See Resources slide for several viewpoints

# Managing Copyright Notices in Software

- All this does no good if you don't make the license you've chosen clear to all
- Need to **assert copyright** and make **license terms** explicit
- Do these centrally or in every file?
  - Single COPYING or LICENSE file per package (or directory)
  - In comments at the top of the file
  - Advantages and disadvantages to each
- ***Best practice: do both***
  - Intelligently, to make it as easy to maintain as possible – script updates!
- Authorship (separate, but related)
  - Version control is best way to maintain accurate records of authorship
- See [Managing Copyright Information within a Free Software Project](#) for details
- Also [Software Package Data Exchange](#) (SPDX, emerging standard)

# Open Licensing of Non-Software Artifacts

- Creative Commons is a family of licenses analogous to open source, but for things other than software
- License variants
  - CC BY (Attribution)
  - CC BY-SA (Attribution-ShareAlike)
  - CC BY-ND (Attribution-NoDerivs)
  - CC BY-NC (Attribution-NonCommercial)
  - CC BY-NC-SA (Attribution-NonCommercial-ShareAlike)
  - CC BY-NC-ND (Attribution-NonCommercial-NoDerivs)
- CC0 Public Domain Dedication
  - Indicates intent to place artifact in the public domain
  - Doesn't satisfy legal requirements in all jurisdictions
- See <https://creativecommons.org>



# Additional Resources

- [Software Freedom Law Center \(SFLC\)](#)
- [https://en.wikipedia.org/wiki/License\\_compatibility](https://en.wikipedia.org/wiki/License_compatibility)
- <http://contributoragreements.org/>, <https://developercertificate.org/> and <http://ebb.org/bkuhn/blog/2014/06/09/do-not-need-cla.html>
- [US DOE ASCR \(open source\) software policy](#)
- Your institution's Technology Transfer Office (or equivalent)
- An Intellectual Property Lawyer (knowledgeable in software)
- Talk to colleagues and learn from their experiences

# Additional resources recommended by others (1/3)

*I have not yet studied these carefully myself, but I trust the people who recommend them.*

- [Neil Chue Hong](#) (Software Sustainability Institute) from his tutorial [An Introduction to Software Licensing](#) (yes, the same title as this presentation, but developed completely independently)
  - [The Whys and Hows of Licensing Scientific Code](#)
  - [A Quick Guide to Software Licensing for the Scientist-Programmer](#)
  - [The Legal Side to Open Source](#)
  - [The International Free and Open Source Lawbook](#)
  - [qLegal: advice for tech start-ups + entrepreneurs](#)
  - [tl;dr legal: Software Licenses in Plain English](#)
  - Open Source Software Watch

## Additional resources recommended by others (2/3)

*I have not yet studied these carefully myself, but I trust the people who recommend them.*

- Todd Gamblin (LLNL)
  - License compatibility resources
    - Open Source Licenses and their Compatibility
    - Which Licenses May Not be Included within Apache Products?
  - (Re-) Licensing considerations of various organizations
    - LLVM Contemplates Relicensing, LLVM Relicensing Effort
    - HEP Software Foundation licensing working group, particularly:
      - <https://hepsoftwarefoundation.org/organization/2017/02/21/licensing.html>
      - <https://hepsoftwarefoundation.org/organization/2018/05/09/licensing.html> included this Update on Software Licensing
    - EasyBuild: GPLv2 licensing is a big issue, consider relicensing to BSD
    - GEANT Intellectual Property Rights Policy

## Additional resources recommended by others (3/3)

*I have not yet studied these carefully myself, but I trust the people who recommend them*

- More from [Todd Gamblin](#) (LLNL)
  - Patents in software licenses
    - [Why so little love for the patent grant in the MIT License?](#)
    - [React's New MIT License: The Circus Enters Its Third Ring](#)
    - [GitLab freezes GraphQL project amid looming Facebook patent fears](#)
    - Rust: [Rust license changing \(very slightly\)](#), [Why dual MIT/ASL2 license?](#)