Open source practices to support in-house innovation

Open source dominates the software industry and, by its very nature, appears to be at odds with IP protection. As open source packages continue to grow in popularity, in-house counsel should be aware of the pitfalls of their use and the complex IP landscape

By Michael Moore, Judy Shie, Joe Kucera, Tarisa Wain and Ron Karr

Open source software usage and the associated licensing issues are one of the most common concerns facing technology IP attorneys today. This is particularly true now that innovation is performed more in software and less in dedicated hardware, such as semiconductor chip or programmable devices (eg, field-programmable gate arrays).

One of the primary benefits of software is the speed at which it can be developed, prototyped and iteratively tested, when compared to silicon or hardware solutions. One factor that enables this speed is the wide availability of public, pre-tested and readily available software (so-called 'open source packages' or simply 'packages' in software terminology) on repositories such as GitHub and SourceForge, among many others.

Open source packages are generally available to download by any member of the public, without requiring monetary payment. However, they come with an associated non-negotiable software copyright licence, which governs their use (sometimes commercially), distribution and modification. These open source software licences – particularly the so-called 'copyleft' or 'viral' flavours – use the legal copyright in the software as a mechanism to enforce certain behavioural norms within the broader software community.

The primary differences between open source software and closed source (proprietary) software relate to the payment of money and access to the underlying source code. With open source software, there is no warranty and typically no payment required. In addition, the express intent of the author and any subsequent contributor is that the source code be kept publicly available indefinitely, with clear and public attributions to the author or copyright holder. This is to allow the public to view, contribute to, improve, modify and use the software, within the bounds of the open source licence. Any documentation or user guides, to the extent that they exist, tend to be written for a technical audience and are less readily usable by a lay user.

Typically, no support is provided with open source packages – although in some cases, technical support may be purchased separately or provided under a commercial licence for the same software. Some open source packages are offered as part of a dual-licensing arrangement where the package is distributed under an open source licence to promote its adoption in the community; however, where commercial use or use with support or consulting services is desired, a separate commercial licence may be purchased from the copyright holder.

In contrast, with proprietary software (eg, a popular suite of office productivity tools), the source code is unavailable, copying is forbidden without purchase of a licence key and support is provided by the software vendor.

Issues for in-house counsel

There are certain concerns that practitioners – particularly in-house counsel at software companies – should consider around permitting or even encouraging use of open source packages.

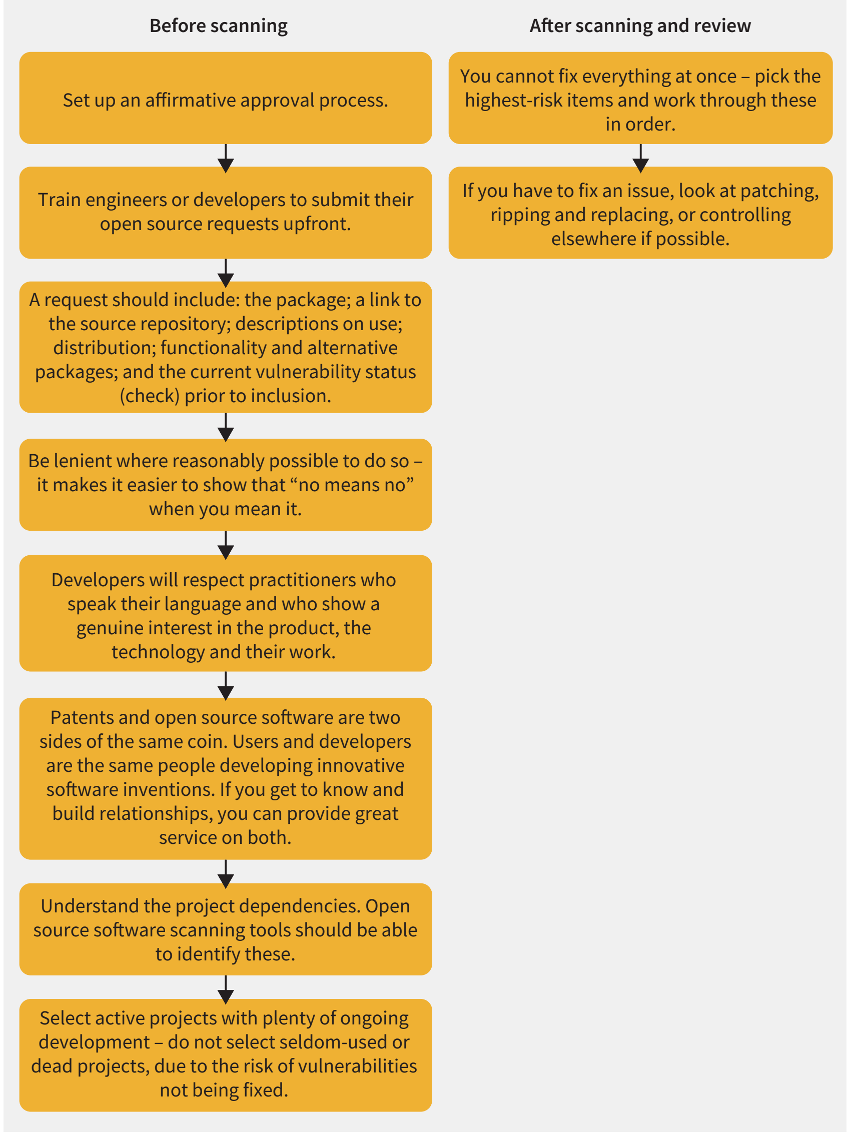
Open source software is a useful tool and, when used correctly, can significantly improve productivity and speed to market for software products. With careful handling, it is a boon to advancement and product development; however, if mishandled, the results can be negative.

In the context of a typical fast-moving software company, developers (software engineers or programmers) are often under release deadlines to complete product testing and delivery as quickly as possible. This can lead to less careful developers simply 'grabbing something' off the Internet and incorporating it into the product for the sake of expediency.

Without careful and deliberate documentation of where the code was sourced from and the version of any package used, the company faces significant risks. These include copyright breach (legal consequences), functional deficiencies in the code (technical consequences) and even security vulnerabilities (data breach consequences) being introduced into the software, often through unpatched weaknesses in a stale version of an open source package.

In the context of intellectual property, developers may put the company's assets at risk if open source software is not used correctly. For example, if developers are using open source in such a manner as to cause the viral licence to attach to company proprietary code, then the company may be obliged to make a portion of its proprietary source code public. If the company considers its proprietary source code to be a trade secret, this can be effectively lost, along with a portion of copyright value in the affected code. Alternately, a company may need to remediate the situation by spending significant resources rewriting components that have grown reliant on an inappropriately licensed open source component.

FIGURE 1. Building an open source approval flow



Before scanning

1. Set up an affirmative approval process.
2. Train engineers or developers to submit their open source requests upfront.
3. A request should include: the package; a link to the source repository; descriptions on use; distribution; functionality and alternative packages; and the current vulnerability status (check) prior to inclusion.
4. Be lenient where reasonably possible to do so – it makes it easier to show that "no means no" when you mean it.
5. Developers will respect practitioners who speak their language and who show a genuine interest in the product, the technology and their work.
6. Patents and open source software are two sides of the same coin. Users and developers are the same people developing innovative software inventions. If you get to know and build relationships, you can provide great service on both.
7. Understand the project dependencies. Open source software scanning tools should be able to identify these.
8. Select active projects with plenty of ongoing development – do not select seldom-used or dead projects, due to the risk of vulnerabilities not being fixed.

After scanning and review

1. You cannot fix everything at once – pick the highest-risk items and work through these in order.
2. If you have to fix an issue, look at patching, ripping and replacing, or controlling elsewhere if possible.

Training your engineers and developers

DOs

- Do request developers to take open source software training as part of their engineering career goals:
  - Understand open source software concepts and the main licences; in particular, understand the obligations that such licences can impose on a company.
  - Understand the business context in which the product is offered and whether that context is compatible with some open source software licences.
- Do submit all open source package use requests early with sufficient time to review.
- Do follow up and remediate any common vulnerabilities and exposures identified as part of the package review and scanning.

DO NOTs

- Do not cut and paste code from the Internet.
- Do not use stale packages that are no longer supported.
- Do not use the Affero general public licence.
- Do not forget to mark and track open source software changes (ie, modifications to existing packages).

Interaction between patents and open source software

In the patent space, certain open source licences include a patent grant as a condition of the licence. The Apache 2.0 licence (www.apache.org/licenses/LICENSE-2.0) is one of the more popular licences in the industry and one which most commercial entities find palatable for use in products. The Apache 2.0 licence includes the following term:

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

The Apache Foundation provides a thorough overview of the implications and obligations of this patent term in its FAQ (http://www.apache.org/foundation/license-faq.html).

The widely used general public licence (GPL) 2.0 v3 (https://www.gnu.org/licenses/gpl.html) also has a strong patent licensing term; however, the specific text is long (see Part 11 of the GPL), so will not be repeated here.

In-house counsel should bear in mind that if the developer team is using open source software in such a manner that the copyleft (viral) nature of the licence (eg, GPL) attaches to company proprietary code, then patents that the company holds relating to the code may become encumbered by the patent licence terms of the GPL.

Further, if the developers are contributing code into open source projects covered by such a patent-licensing provision, then any patents that the company holds which are necessarily infringed by the contribution to the open source project can be effectively encumbered by the open source commitment – and their value diminished accordingly.

In a practical context, it is important to train developers (particularly junior or less experienced ones) to obtain managerial and legal approval before pushing code out to external open source repositories and before pulling in open source code, particularly those with copyleft (viral) licensing terms.

Overlap and perceived conflict between open source and patents

The GPL 2.0 v3 has an interesting philosophical statement in the preamble:

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the

Practical tips: details to include in an intake review form

- Is the open source package intended for internal use only, or for external distribution?
  - If external, what distribution method is envisaged?
- What ability is there to update the code post-shipment?
- Can a fix be pushed out easily or is the code in a physical product (ie, isolated in a hardware appliance)?
- Correctly and clearly state any linkages used in the product.
- Provide a link to the source repository (eg, on GitHub) and suggest possible alternative packages with less onerous (ie, less copyleft) licences that would satisfy the same function.

The Linux Foundation provides a helpful set of suggestions: www2.thelinuxfoundation.org/l/6342/2012-03-28/7wb5k/6342/48826/lf_complicate_foss_approval_req.pdf

Practical tips: selecting a code-scanning tool

- Consider why you are scanning:
  - Is it for licence compliance and documenting attributions, to identify and remediate possible security vulnerabilities, or both?
  - Certain commercial tools are better at each of these functions, so pick a tool to best address your goal.
  - Where possible, combine licence compliance scans with security (common vulnerabilities and exposures) auditing.
- Look at the frequency of updates to the knowledge base on which the tool depends.
- Ask whether the tool is cloud-based or locally hosted. If it is local, who manages and resources it? Is there a commitment from the engineering team to support it and provide resources (eg, a virtual machine) for the tool to reside on?
- Verify the granularity of the scan provided by the tool. Does the tool scan package by package or down to individual code snippets within a package? This difference in granularity can lead to different scan outcomes.
- Ask whether the tool can automatically identify the package, version or multiple licences.
- Check how easy the scan tool is to operate and understand. Is it a 'techie only' tool or can non-technical users (eg, a lawyer) understand the output?
- Check whether the tool can be incorporated into your build environment to automatically scan as part of the code production or testing process.
- Check whether the tool can be used for M&A scanning of third-party external codes, as well as for production scanning of internal code. Can the tool support separate non-overlapping scan directories in order to avoid contamination of the internal production code with external third-party code?
- Check whether the tool can easily generate attribution documentation or a bill of materials. This can be a significant time-saver.

special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The broader philosophy of the GPL – and the (stereotypical) view of some software developers who favour the GPL – is that software patents are bad. The logical corollary to this is the philosophy held by some traditional IP attorneys: "Open source? No way!" As with many issues, the truth lies somewhere in the middle.

The pro-GPL software developer view stems from a perceived threat that patents pose to the open source community, as well as a distaste among software developers on the perceived evils of patent assertion entities (PAEs) and the desire not to generate patents that may fall into the hands of PAEs. This is a strongly held belief that in-house counsel must often overcome when developing patents in the context of software-centric organisations.

One analogy that may help to explain the concept to software developers is that patents and open source are often two sides of the same coin (innovation). Patents protect innovation (concepts and details of a technical solution), while open source protects speech (creative expression and a specific code implementation of the technical solution). Patents protect the concept, which may be implemented in multiple ways in a range of software languages. Copyright covers the written expression of one specific implementation typically using one specific software language (eg, code written in C++).

Open source software protects – via copyright – the freedom of expression to copy, distribute, modify, comment on and improve on a specific implementation of the code, by preventing the code from being locked down as a trade secret. Open source also helps to identify bugs and weaknesses in the code by permitting many eyes to peer review the code in parallel and thus provide different perspectives. In a famous law attributed to Linus Torvalds, the creator of Linux, "given enough eyeballs, all bugs are shallow" – meaning that, with sufficient peer review, functional flaws and security vulnerabilities are more likely to be discovered.

As mentioned, patents protect the underlying concepts, techniques or methods which are implemented in the solution – regardless of the software language used to code it. Patents preserve the ability of the creator (often a developer) to protect their innovation, while allowing the knowledge (concepts and details as expressed in the patent text or drawings) to become public for others to learn from, modify and improve on. In addition, if the code is released under an open source licence, the inventor or author can allow the

Common types of open source licence

There are a wide variety of open source licences available, ranging from mild to wild. Some licences (eg, Massachusetts Institute of Technology (MIT), Berkeley Software Distribution (BSD) and Apache 2.0, as well as simple attribution-type licences) are considered fine and appropriate for commercial use. Others (eg, the Affero general public licence (GPL)) are sometimes considered unsuitable for commercial use. There is a whole spectrum in between, with varying levels of obligation for the user and associated risk. One primary risk that in-house counsel should consider is the potential for an extension of obligations to company proprietary code caused by the use of open source licensed code alongside the proprietary code. This is referred to as the 'viral' nature of certain open source licences, such as the GPL and the lesser GPL.

In 2015 popular open source repository site GitHub published Table 1, showing the approximate proportion of licence usage on the site.

Over the past two years, the relative proportion of these licences has changed slightly, with MIT becoming more popular, according to certain commercial vendors.

TABLE 1. Approximate proportion of licence usage

Rank	Licence	% of projects
1	MIT	44.69%
2	Other	15.68%
3	GPLv2	12.96%
4	Apache	11.19%
5	GPLv3	8.88%
6	BSD 3-clause	4.53%
7	Unlicense	1.87%
8	BSD 2-clause	1.7%
9	LGPLv3	1.3%
10	AGPLv3 (Affero)	1.05%

Source: https://blog.github.com/2015-03-09-open-source-license-usage-on-github-com/

TABLE 2. Practical checklist for scanning before software release date

Action	Explanation
Verify licence of the open source package reported by the developer.	The developer – as the user of the open source package – should identify the package source and licence. However, the licence should still be checked at the source (eg, GitHub or SourceForge) as part of the legal review, as licences are often misreported or misidentified by developers.
Allocate enough time to review the results from the scan tool.	Scan tool results are important, but often imperfect. The reviewer may need to dedicate time to examining the reported results in order to determine what is correct – sometimes even referring to the code itself. Scan tools often report multiple licence types associated with a single package – a reviewer may need to check the repositories to verify what is stated in the code.
Confirm the licence for the version of the package being used.	Different versions of the same package may be released under different licences. Ensure that the licence you review matches the version of the software being used.
Document where the package was obtained and where the licence text was verified.	Open source project websites are constantly changing and may disappear – this ensures documentation for your open source use.
Work in partnership with the security team.	Ensure that all results are fed forward into the security team. Knowing what you have is good, but knowing that it does not contain serious vulnerabilities is far better. Do this well ahead of the release date to give internal clients (eg, engineers and developers) time to fix any issues.
Be prepared to share open source usage with customers.	Customers will ask about open source usage – you must be prepared to show them what you are using, the scanning tool used and what the vulnerability management process entails.
Include a developer or other technical resource on the open source software review team.	Most attorneys cannot plough into the code themselves due to insufficient knowledge of coding or insufficient time to spend on this. This may require establishing a relationship with engineering management in order to get the time from the technical team. Demonstrate value to the engineering management team by showing that fixing issues early is quicker, cheaper and a lot less embarrassing than fixing them after a breach or a request from the customer.
Scan the codebase well ahead of the release date.	Ask for a frozen codebase in advance (eg, a month before release). Scan the codebase and you can always scan for deltas from the frozen version closer to the release date. Scanning takes time and resources. Developers will be extremely busy as the release date approaches, so do not impose on them right before release (ie, crunch time).
Prepare the attribution notice document, as well as any in-product notices as required.	Almost every open source licence requires proper attribution to the copyright holder of the open source package, so it is good practice to include an attribution document as part of the software release. Some open source licences require attributions or notices within the software itself – check the applicable open source licence to determine whether an in-product notice is required.
Ensure that the process for responding to external open source software source code requests is in place.	Some open source licences (eg, the general public licence) allow users to choose between providing the open-sourced source code at the time of distribution or making an offer to provide the source code on request. If you choose the latter option (on request), ensure that you will be able to respond to such a request with the correct corresponding source code (eg, the correct version, including any modifications).
Know and agree when 'close enough' is good enough.	What budget is required for a scan tool, engineering and legal time, among other things?
Have a plan in place for dealing with difficult scenarios.	Decide how to remediate problems that are discovered after the fact and when to rip and replace code.

implementation (copyright in the code) to be made public for the same purposes. The patent may also serve as a backstop (in addition to copyright law) to enforce the author's rights in the event that a third party breaches the terms of the open source licence used, as any breach typically terminates a patent licence associated with the open source licence.

Companies can show good faith and demonstrate to software developers that their patent activities are not a threat to open source software or the freedom of innovation by joining organisations such as the Open Invention Network and the Licence On Transfer Network.

Through the education of technical teams and legal practitioners alike, patents and open source software can happily coexist – forming essential pillars of IP protection and usage in software companies.

Action plan

Like fire, open source is an effective and valuable tool when used appropriately.

- Train your developers to understand and respect it, as well as to engage the legal team early in the process, and everyone will benefit from improved productivity.
- Know your open source licences – understand which licences may have copyleft or viral effects on proprietary code and which licences are permissive.
- Train developers about the risks associated with open source licences, including the potential risk of encumbering company patents.
- Work with the developer team to track and review all open source software usage.
- Be aware of, and sensitive to, the time constraints on the developer team – scan your code well in advance of the release date and have a plan to deal with any problems raised.
- Maintain accurate documentation of open source software used in each software product.

Open source software in M&A

In the context of M&A, open source diligence is an important and often complex process. The acquirer wants to understand any pre-existing obligations on the codebase and potential encumbrances on any patents that may be part of the target company. These obligations and encumbrances may significantly affect the deal value, as the acquirer must avoid purchasing a problem if there are hidden obligations in the target company. Similarly, the target company must understand and be able to demonstrate clear compliance with any such open source obligations in order to improve the likelihood of a successful sale and maximise the value received.

The target company should also endeavour to show a complete and clear listing of all open source packages used in its product(s), along with version information, distribution status and whether commercial licences have been purchased for certain packages. Where the target company demonstrates good discipline and clear internal processes and policies around selection and approval of open source licences, as well as the packages that it uses, this can go a long way to reducing concerns on the part of the acquirer.

It is still incumbent on the acquirer to perform thorough due diligence on the codebase before the acquisition. One of the most effective ways to do this is to have an objective third party scan the entire codebase using a commercial scanning tool. There are several of these tools and service providers available, and the acquirer should familiarise itself with the quality, reputation and price of services of the various commercial vendors. A service provider should be engaged well ahead of any prospective acquisition in order to avoid last-minute surge pricing during a deal. The scanning service provider market is competitive, so acquirers will likely find the best pricing by shopping around and comparing quotes from multiple vendors.

On receiving a scan report from the service provider, the acquirer should carefully compare this to any self-reported open source listing from the target company. Any significant discrepancy should be a red flag to the acquirer that the target's internal diligence process may be weak and may need further training and careful oversight. If the scan report flags the use of packages with copyleft licences in a manner that creates obligations for the target company to disclose proprietary code, or which encumbers valued patents of the target company, this should be considered as part of the overall deal value. An acquirer may consider requesting the target company to (where possible under a dual-licence scheme) obtain commercial licences to the problematic open source packages. Alternatively, the acquirer may have to factor in a cost and timeline to rip and replace the problematic open source packages in order to bring the target company into compliance with its licensing obligations, affecting the deal value and attractiveness accordingly.

"Patents and open source are often two sides of the same coin (innovation). Patents protect innovation, while open source protects speech"

Tracking open source software bill of materials and changes

An accurate bill of materials should be compiled and maintained by the engineering or development team for every version of the software product released. Just as with a physical product, a bill of materials identifies the open source packages and versions used in creating the software product – this is essential documentation for handling future support issues. Any modifications made to the open source packages should be documented in the source code, either through comments in the modified file or in a separate comments file. If the developer wants their modifications propagated into future versions of the open source software, they may consider contributing their modifications back to the open source software project, after first confirming with the legal department that such a contribution would not negatively affect the company's IP rights. iam

Michael Moore is vice president and assistant general counsel of products and intellectual property, **Judy Shie** is product legal counsel, **Joe Kucera** is senior IP strategy manager, **Tarisa Wain** is product and patent lead programme manager and **Ron Karr** is director of technical strategy, chief technology officer's office at Pure Storage Inc