Docker – Insecurely Wrapping Secure Software.

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SYD0x05

March 2015

A short(ish) spiel on how monolitic tools like Docker can create insecure systems through trivial vulnerabilities, especially if they are built atop secure software.

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* **tl;dr**: If you thought that Docker was a cool way to use secure Linux kernel features, think again.
* *Disclaimer*: I don't work for Docker, so anything I say (offensive or otherwise) isn't funded by that sweet, *sweet* Docker money.

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Figure: "1 g0t th4t D0ck3r m0n3y!"

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* The reason why people (including me) rave about Docker so much is because it solves a problem that developers and sysadmins have been trying to solve since time immemorial:
  * How *exactly* do you ensure that you can deploy some software anywhere in your datacenter without undergoing dependency hell?

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* . . . but I'd be glad to demo it if you like. `:P`

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* "What vulnerabilities?" I hear you say . . .

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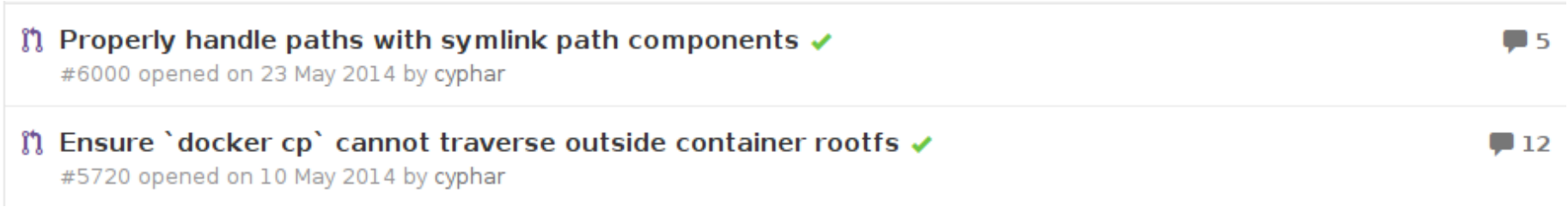

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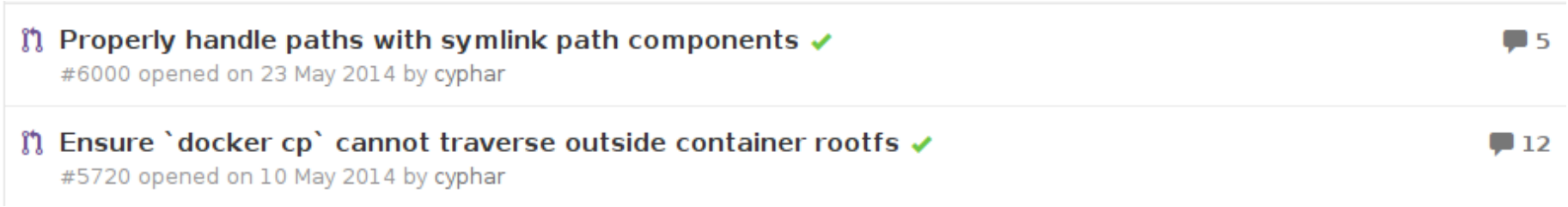

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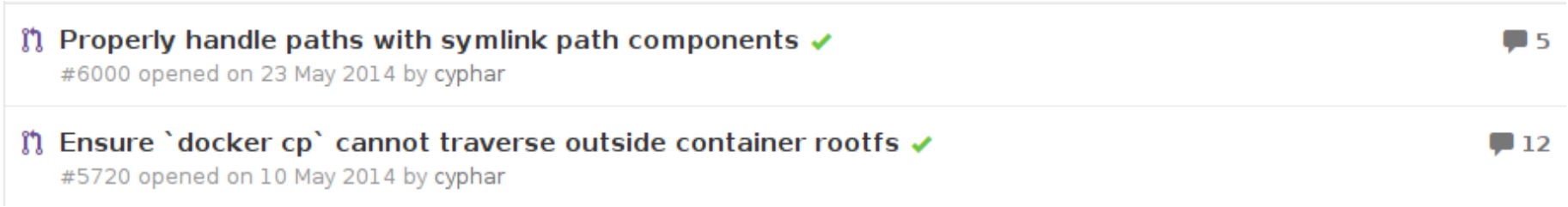

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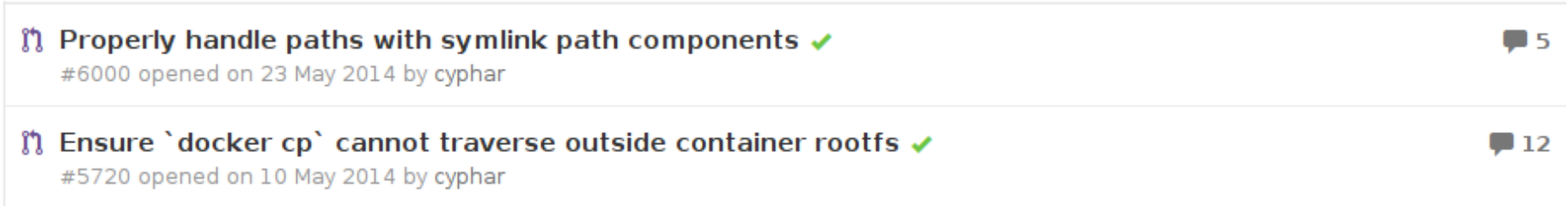

* The above are fixes for **two** vulnerabilities involving path sanitisation and symlinks.
  * They allow you to read **any** file as though you are `r00t`.
* This vulnerability affects `docker<0.12.0`, so if you've updated in the last year you're not vulnerable.

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* There were a few others, but for some reason I've been unable to replicate them – even after `git bisecting` the repo.

Demo!

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* Looks like they didn't learn their lesson the first time . . .

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* It was also possible to use `docker cp` to copy data from `<path>` on the host (this wasn't documented anywhere, I discovered it while setting up the demos).

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CVE-2014-9358 Image IDs weren't properly sanitised when communicating with the registry or from `tar` image archives, so you had a path traversal again. `docker<1.3.3`

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  * As a result, you could escape the Linux containerisation because the wrappers were insecure.
* I personally find it interesting how many of the vulnerabilities are related to path sanitisation.

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* As it turns out, there are a **bunch** of dangerous patterns that result in you being able to gain read-write access to the **host's** `docker.sock` socket.
* These dangerous patterns cause vulnerabilities that are traditionally host-facing (which include most of the ones I've covered) now become container-facing, escalating the vulnerabilities to the level of sandbox bypassing.

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* *Aside*: Isn't it interesting that all of the core maintainers work for one company?

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* While the future of Docker (from a security perspective) might sound fairly bleak, *it is possible to secure Docker with some best practices and other kernel security features*.

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* Make sure that all the images you run are verified (or built by **you** from a verified image). And of course, make sure the verified image is signed.

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  * Remember, `r00t` in a Docker container is `r00t` outside of it, so the kernel lets you do any syscall tomfoolery you want.
* If you use the LXC execdriver, you can take advantage of the `USER` namespace.
  * — but don't use the LXC execdriver. There have been several cases where vulnerabilities found in both the native and LXC execdrivers have not been fixed in the LXC execdriver for several releases.

Securing Docker?

* Essentially, just follow the general best security practices even when using Docker. Docker is an ingredient, not a complete solution.

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* My only complaint is that the Docker development community needs to be more aware and should actively try to solve those issues.
* And actually, they are. `USER` namespaces are confirmed to land in `docker=1.6`. And people like myself are constantly working on finding and fixing security vulnerabilities.

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* Attacking a system is all about attacking the lowest hanging fruit.
* And insecure wrappers of secure software are the lowest hanging fruit in such systems. But they're also in the weird position that they are "trusted" to manage secure sofwtare.

The Big Picture™.

* Okay, so maybe you don't use Docker and you don't do pentests of Dockerised systems. That's fine! There is a bigger picture here.
* Attacking a system is all about attacking the lowest hanging fruit.
* And insecure wrappers of secure software are the lowest hanging fruit in such systems. But they're also in the weird position that they are "trusted" to manage secure sofwtare.
* So don't be fooled by the idea that a secure piece of software suddenly lends its security to the insecure wrappers that manage it.

The Bottom Line™?

The Bottom Line™?

Insecure wrappers of secure software create insecure systems which have the illusion of security.

Shameful Plugs.

Shameful Plugs.

* If you want to see more of my stuff, check out my:
  Website : `https://www.cyphar.com/`
  Twitter : `@lordcyphar`

Questions?

fin.