Dedicated to supporting the FreeBSD Project and community

Upcoming Events

AsiaBSDCon 2018
FreeBSD Developers Summit
March 8-9, 2018
Tokyo, Japan

AsiaBSDCon 2018
**March 8-11, 2018**
Tokyo, Japan

SCALE 16x
March 8-11, 2018
Pasadena, CA

FOSSASIA 2018
March 22-25, 2018
Singapore, Singapore

FreeBSD Journal
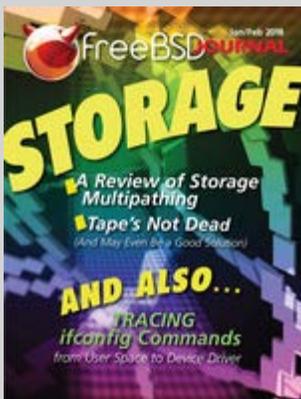
The January/February issue of the *FreeBSD Journal* is now available. Don't miss articles on Tracing ifconfig Commands, Storage Multipathing, and more.

New Feature! Browser-Based subscribers now have the ability to download and share

Message from the Executive Director

Dear FreeBSD Community Member,
Welcome to our February Newsletter! In this newsletter you'll read about conferences we participated in to promote and teach about FreeBSD, software development projects we are working on, why we need funding, upcoming events, a release engineering update, and more.

Enjoy!

Deb

February 2018 Development Projects Update: The Modern FreeBSD Tool Chain: LLVM's LLD Linker

As with other BSD distributions, FreeBSD has a base system that is developed, tested and released by a single team. Included in the base system is the tool chain, the set of programs used to build, debug and test software.

FreeBSD has relied on the GNU tool chain suite for most of its history. This includes the GNU Compiler Collection (GCC) compiler, and GNU binutils which include the GNU "bfd" linker. These tools served the FreeBSD project well from 1993 until 2007, when the GNU project migrated to releasing its software under the General Public License, version 3 (GPLv3). A number of FreeBSD developers and users objected to new restrictions included in GPLv3, and the GNU tool chain became increasingly outdated.

The FreeBSD project migrated to Clang/LLVM for the compiler in FreeBSD 10, and most of GNU binutils were replaced with the ELF Tool Chain suite of binary utilities (tools like size, strings, strip, etc.) in FreeBSD 11. These tools provided compelling replacements for FreeBSD, leaving the linker as the only significant remaining issue. We desired a permissively licensed linker with feature parity with GNU ld,

Why Choose FreeBSD?

but none existed. LLVM included a linker named lld, but it was not sufficiently capable to meet the requirements of the FreeBSD system linker.

In May 2015 Rui Ueyama of Google committed the beginning of a new section-based COFF linker to lld, and in August 2015 the new COFF implementation became the default. In July 2015 Michael J. Spencer committed a new ELF linker implementation based on the section-based COFF support, and on 17th November 2015 this implementation became the default.

On April 13, 2015 I submitted a tracking issue to LLVM's bug tracker, to coordinate work on issues found in FreeBSD. Since then, 85 individual issues were identified and submitted as dependencies. These have been addressed, along with more than two and a half years of development on lld in the upstream repository.

Compared to the GNU bfd linker in the base system (version 2.17.50), lld brings many features and improvements:

- AArch64 (arm64) support
- Link Time Optimization (LTO)
- New Application Binary Interface (ABI) support
- Additional linker optimization
- Much faster link times
- Support for security enhancements
- Maintained code base

For users, one of the most noticeable changes is likely to be the build time improvements. I tested linking a debug build of Clang on my 8-core desktop machine. I used the GNU BFD linker in the base system, the GNU BFD and Gold linkers from the ports tree, and lld with and without threading enabled. The results are presented in the graph below; lld in its default threaded configuration was over 25 times faster than GNU ld in the base system.
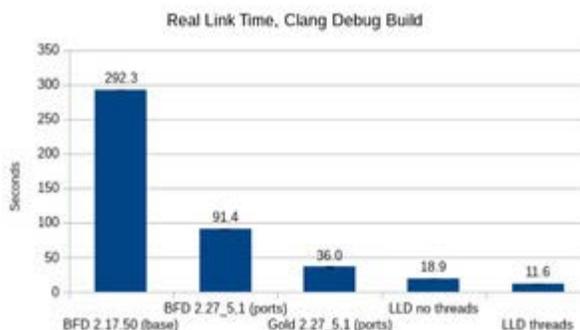
Over the past three years I've tracked the work necessary to enable lld as the system linker in both the base system and ports tree, and committed and coordinated changes to FreeBSD and lld. FreeBSD's Clang/LLVM maintainer Dimitry Andric was instrumental in helping to incorporate and test these changes, as was Antoine Brodin of the FreeBSD portmgr team, who executed numerous experimental builds of the FreeBSD ports tree with lld installed as /usr/bin/ld.

We have been using the lld linker as the system linker for
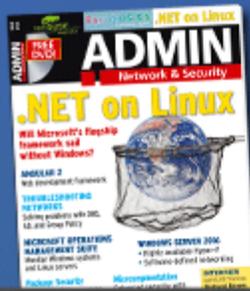
FreeBSD/arm64 since FreeBSD 11.1. As of January 10, 2018, in the -CURRENT development branch, lld is also the default bootstrap linker for FreeBSD/amd64. This means that the kernel and userland libraries and binaries are linked by lld. There's a small amount of ongoing work to ensure that the transition to lld happens as smoothly as possible for the ports tree, but I expect to be using lld there too within several weeks. Work is in progress to enable lld for the remaining architectures supported by FreeBSD.

I'd like to express deep gratitude to upstream lld developers Rui Ueyama, Rafael Espindola, George Rimar and Davide Italiano. They put in substantial effort in addressing the issues we found affecting FreeBSD/amd64.

-- *contributed by Ed Maste*

Fundraising Update: The Power of Partnerships

The FreeBSD Foundation is a 501(c)(3), US based, non-profit organization dedicated to supporting and promoting the FreeBSD Project and community worldwide. Funding comes from individual and corporate donations and is used to fund and manage operating system improvements; FreeBSD infrastructure improvements, including Release Engineering, developer tools, and hardware; sponsor BSD-related and open source events; provide FreeBSD advocacy and education, and to provide face-to-face opportunities for FreeBSD developers and commercial users. We also provide legal support to the Project, and own the FreeBSD trademarks.

Our current fundraising activities barely cover the costs of what we need to accomplish including, having 9 full and part-time staff members to support our work of making FreeBSD the best platform for education, research, computing, and commercial products.

Last year, we introduced a new Partnership program, to encourage more commercial users who benefit directly and indirectly from FreeBSD, to contribute financially to our efforts. Depending on the partnership level, Partners receive additional opportunities for community and Foundation support and engagement, as well as, co-marketing opportunities.This month I'd like to put out a request to people who work for companies that benefit from FreeBSD, to email their managers and decision makers with a list of how the company benefits

from FreeBSD and a link to our Partnership program.

Some questions to ask are:

- Do we benefit by the Foundation having full-time software developers who can quickly jump on critical issues and get workarounds and/or fixes into the tree as soon as possible?

- Do we benefit by having timely and reliable releases in part because of the Foundation having a full-time Release Engineer on staff?

- Do we benefit from the Foundation growing the number of FreeBSD contributors and users through their global FreeBSD outreach and advocacy efforts, including expanding into new regions like China, India, Africa, and Singapore?

- Do we benefit from the Foundation having a paid employee as a leader on the security team, who is now triaging the backlog of issues?

- Do we benefit from the Foundation managing and funding software development projects by internal and external software developers, including the OpenZFS RAID-Z Expansion project, Broadcom Wi-Fi infrastructural improvements (bhnd(4) driver), ongoing new Intel server support, and extensive progress towards a fully copyfree toolchain?

More information about our Partnership program to share with your company is available here.

If you are not comfortable asking, please connect me with the appropriate person from your company. We would be happy to meet personally with the decision makers to have an in-person opportunity to discuss why it's crucial to companies that use FreeBSD to support our efforts.

Please feel free to email me deb (at) freebsdfoundation (dot) org to help us work on a partnership with your company!

Finally, if you haven't donated this year, please consider making a donation now!

-- contributed by Deb Goodkin

Conference Recap: FOSDEM 2018

Earlier this month, I had the opportunity to attend FOSDEM 2018, a two-day free and open source software conference in Brussels, Belgium, on February 2-3. Founded in 2000, this is an annual conference organized and run by volunteers, and it's free! Because it's free, they get a lot of attendees. In fact, there were over 5000 attendees this year!

The Foundation sponsored the FreeBSD Developer Summit that preceded the conference, and the FreeBSD stand at the conference.

The Foundation sponsors these types of events to promote FreeBSD and recruit new users and contributors to the Project. We sponsor developer summits around the world to provide face-to-face opportunities for FreeBSD contributors to work together, share knowledge, and have productive discussions on different areas of the FreeBSD Project.

FreeBSD Developer Summit
Benedict Reuschling organized and ran the summit, which had 22-24 attendees. The summit kicked off at 9am with attendees introducing themselves, including what they were working on, and what they would be interested in discussing during the summit.

Some of the topics discussed were how to come up with a Google Summer of Code project and how to become a mentor, DTrace, graphics support, storage, how BSD certifications will be offered from the Linux Professional Institute, and a presentation on possible release models. The discussions were productive, and I felt like we accomplished a lot.

FOSDEM and the BSD devroom
As I mentioned earlier, FOSDEM is big! There were 651 speakers, 690 events, and 57 tracks, that took over 33 rooms spread across several buildings of the Solbosch campus of the ULB (Université Libre de Bruxelles). There were keynotes, main tracks, and at least 42 developer rooms, lightning talks, and certification exams (including a BSDCG exam).

The BSD devroom, organized by Rodrigo Osorio, happened the first day of FOSDEM. There were 11 talks that day, to a full room of over 100 people. I was the first one up to give my talk: The FreeBSD Foundation and How We Are Changing to World.

We also had a FreeBSD stand, also known as a table or booth in the US. FreeBSD contributors volunteered to staff the stand and talk to people. I showed up at our swamped stand, right around lunch time. We had hundreds, if not thousands of people stopping by our stand. Most of the visitors who stopped by, were familiar with FreeBSD. Many had questions about their setups, and our volunteers were able to help them. I had my Raspberry Pi 3 FreeBSD demo setup on display, which drew a lot of people to check it out. We also had a sign that showed many of the companies who use FreeBSD. The purpose was to help highlight how FreeBSD is growing, and that there are many marquee companies successfully using it. Lastly, there were a few people that genuinely wanted to contribute to the Project, which was exciting to hear.

We handed out over 500 FreeBSD stickers, 300 FreeBSD pens, and other items like tape measures ("Does Your OS Measure Up!"), and luggage identifiers. We also had FreeBSD advocacy fliers that introduced people to FreeBSD.

The free swag, Groff, and the RPi 3 demo drew many people to the stand, but most people stayed and talked to us to either learn more about FreeBSD, or, if they were familiar with FreeBSD, ask questions.

Overall, it was a great experience. It not only provided an excellent opportunity to promote FreeBSD, but also, to meet others from the community, and those interested in open source. I look forward to promoting FreeBSD at more open source conferences around the world.

-- contributed by Deb Goodkin

Release Engineering Update

We're again gearing up for the latest release. The initial draft of the 11.2-RELEASE schedule was proposed within re@ for review. We then sent the proposed schedule to the developers list and added to the Project website.

We also worked on updating and testing the release.sh wrapper script used for release builds to enable parallel architecture builds, reducing overall start-to-finish build time per branch. After ensuring no problems, committed the change to the public repository in svn://svn.freebsd.org/base/user/gjb/thermite/ as revision r329385.

-- contributed by Glen Barber

Faces of FreeBSD: Raichoo

Welcome to the first 2018 edition of the Faces of FreeBSD series. Here's a chance to get to know your fellow FreeBSD enthusiasts. Sit back and enjoy the next Faces of FreeBSD story.

Tell us a little about yourself.
I'm a software developer at a small software company in Germany where I mainly write Haskell and use FreeBSD as my workstation operating system. In my free time I contribute to various open source

projects to scratch my itches. I also speak at conferences from time to time where I talk about things that excite me.

How did you learn about FreeBSD and/or when were you first exposed to it?
It's a bit embarrassing, but the first time I downloaded FreeBSD I wasn't really aware that it was actually another operating system, I thought it was a Linux distribution. That was around 1999-2000. It didn't really work on the odd hardware I had back then so I dumped it. It took me a while to find out that the BSDs were in fact their own thing. A couple of years later I tried out OpenSolaris and fell in love with DTrace and ZFS right away, but we know how that ended… So that actually got me interested in FreeBSD since they were getting those technologies to work for them. And now thanks to the great`drm-kmod next`project I'm able to have all those nice things on my laptop, and that's pretty exciting to me!

What is your involvement in FreeBSD?
I just recently got involved with the FreeBSD community. I gave a talk about DTrace at the 34th Chaos Communication Congress and in the wake of that I got invited by Benedict to join the FreeBSD Devsummit at FOSDEM. I've made a small contribution by enabling DTrace probes in the Glasgow Haskell Compiler runtime for FreeBSD. Right now people are referring to me as a driving force behind the local FreeBSD community since I seem to get quite a lot of people interested in the system.

Why do you like FreeBSD?
I like how everything fits together so neatly, the whole-system approach really makes quite a difference. Everything feels a lot more polished and documented than in other systems. I rarely need to search to documentation online, most problems I encounter can be resolved by browsing through the manpages. I also enjoy reading the source code quite a lot. Of course things like DTrace and ZFS are what brought me to FreeBSD in the first place, but I quickly got to appreciate all those little (and not so little) things, like having clang and llvm in the base system, the clean separation between base system and ports, bhyve, the whole networking stack. My absolute favorite thing about the system is how transparent everything is, mainly because of DTrace and friends. Whenever something doesn't work quite the way as I expect it, I just fire up DTrace and now I can look at everything that's going on inside of the system. That's incredibly powerful and it gave me a whole new appreciation of what the OS can do for me, especially when developing software.

New Hosting Partner: CyberOne Data

The Foundation would like to thank [CyberOne Data](#) for hosting our new mirror site. The addition of this site allows the Project to have a Central US mirror that will supplement the East Coast and West Cost sites and will host an svn mirror, ftp mirror, pkg mirror, portsnap mirror and freebsd-update mirror.

It's because of generous in-kind donations such as this, that allows us to ensure site redundancy and availability. Thanks again to CyberOne Data for your continued support of FreeBSD.

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