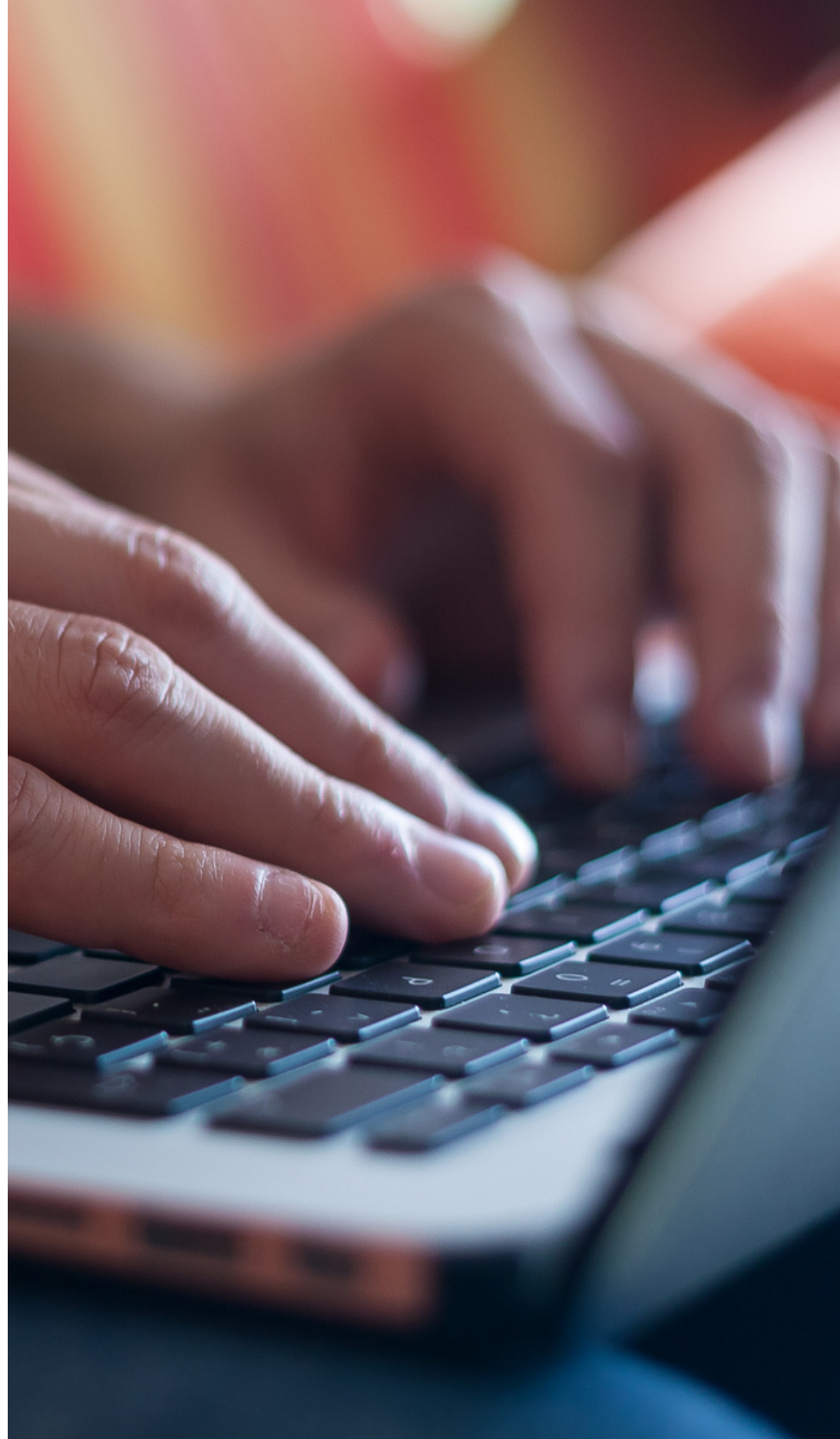


2021

IMPACT REPORT



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www.freebsd.foundation.org

3980 Broadway Street
STE #103-107
Boulder CO 80304

Message from the Executive Director



For over 21 years, the Foundation has been here to support the FreeBSD Project and community, by stepping in to fill critical needs in order to improve FreeBSD and make it the performant, secure, and reliable operating system folks depend on. As someone who has been with the Foundation for over 16 years now, I've seen it grow from having no employees to a staff of eleven. We started out focusing on sponsoring just a few conferences and software development projects. I'm very proud to say that this year we've done more to support FreeBSD than ever before. We've grown to having

a small staff who can step in to advocate for the Project, quickly fix bugs, review changes, and develop improvements to make FreeBSD not only the best operating system available, but the best open source community to be involved with.

This past year has been challenging with travel restrictions, folks working from home, and the feeling of isolation. Thankfully, we saw the community come together to support each other through more online engagement, whether supporting each other technically, or on a personal level. The support I see folks give each other over mailing lists, social media, and other formats makes me believe there is a lot of good in this world, and I'm proud to be part of this community.

“ I'm very proud to say that this year we've done more to support FreeBSD than ever before. ”

We at the Foundation are also a community, made up of people located around the world, who support FreeBSD in many different ways. We are passionate about this community. The team is always coming up with new ways to connect community members, helping to bring new people to the Project, and determining what software improvements we can implement to make significant improvements to the OS. We thrive on overcoming Project challenges by developing ways to make things better.

How do we know where to step in? We watch market trends, stay on top of discussions happening in various mailing lists and irc channels, and listen to you, the users, by surveying the community over social media and on mailing lists. We also meet with various commercial users to understand how they are using FreeBSD and what challenges they may face.

In this report, you'll learn about the areas we supported in the FreeBSD Project in 2021. You'll see how and why we grew our team, and what we did to increase online engagement within the community. You can read about our technology roadmap to understand how we came up with the plan, and why we are focused on these areas. We also started collecting data, to help show the growth of FreeBSD as we move forward.

Message from the Executive Director

Our purpose is to be the stewards of the FreeBSD Project's funds and the following will highlight how we spent that money. I hope you see that throughout this report, and let us know if there is an area that you'd like to see us supporting in the future.

2022 is a big question mark on whether we'll get back to in-person events. I'm optimistic that we will start doing a mix of in-person and online events. Either way, we will be here, behind the scenes, supporting you, the FreeBSD Project and community.

Sincerely,
Deb Goodkin, FreeBSD Foundation Executive Director

FreeBSD Foundation Board of Directors



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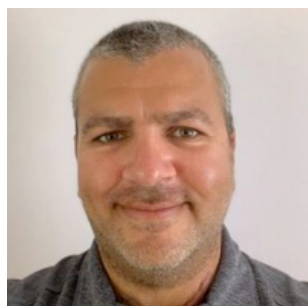
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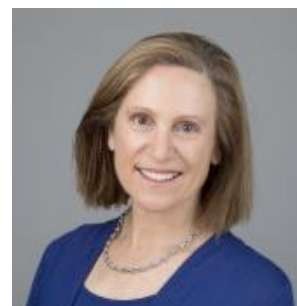
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SECRETARY
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Who We Are

The FreeBSD Foundation is a 501(c)(3), US based, non-profit organization dedicated to supporting and promoting the FreeBSD Project and community worldwide.

The Foundation funds software development via project grants and provides staff to immediately respond to urgent problems and implement new features and functionality.

The Foundation purchases hardware to improve and maintain FreeBSD infrastructure, and funds staffing to improve test coverage, continuous integration and automation.

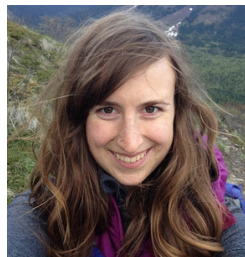
The Foundation advocates for FreeBSD by promoting FreeBSD at technical conferences and events around the world. The Foundation also provides workshops, educational material, and presentations to recruit more users and contributors to FreeBSD.

The Foundation also represents the FreeBSD Project in executing contracts, license agreements, and other legal arrangements that require a recognized legal entity.

FreeBSD Foundation Staff



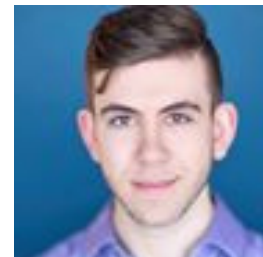
Deb Goodkin



Loren Gurkowski



Anne Dickison



Drew Gurkowski



Ed Maste



Li-Wen Hsu



Konstantin Belousov



Joseph Mingrone



Mark Johnston



Ka Ho Ng



Andrew Turner

Achievements in 2021

The Foundation team worked diligently to grow and support the FreeBSD Project over the past year. In fact, 2021 turned out to be one of our most productive years to date. Check out a few of our biggest achievements.



Increased Number of Software Contributions

In 2021 Foundation staff and grant recipients made 1468 sponsored commits to the src tree. This represents a growth over 2020 of 70%. Thanks to the generous support from the community, we were able to add 3 full time developers. These roles allowed us to make more significant software contributions to FreeBSD.



Progress on Wi-Fi Work

Recognizing the importance of our wi-fi support, we funded Bjoern Zeeb to integrate support for current-generation Intel WiFi devices by migrating to the dual-licensed upstream driver shared with the Linux kernel.



Developer Tools Improvements

The Foundation provided multi stage grants to Mortiz Systems to provide FreeBSD with a modern debugger and bring LLDB closer to being a fully featured GDB replacement.



Increased FreeBSD Advocacy Efforts

The generous community support also allowed us to bring on a marketing coordinator which provided the opportunity to increase our social media presence and more frequently update and create how-to guides.

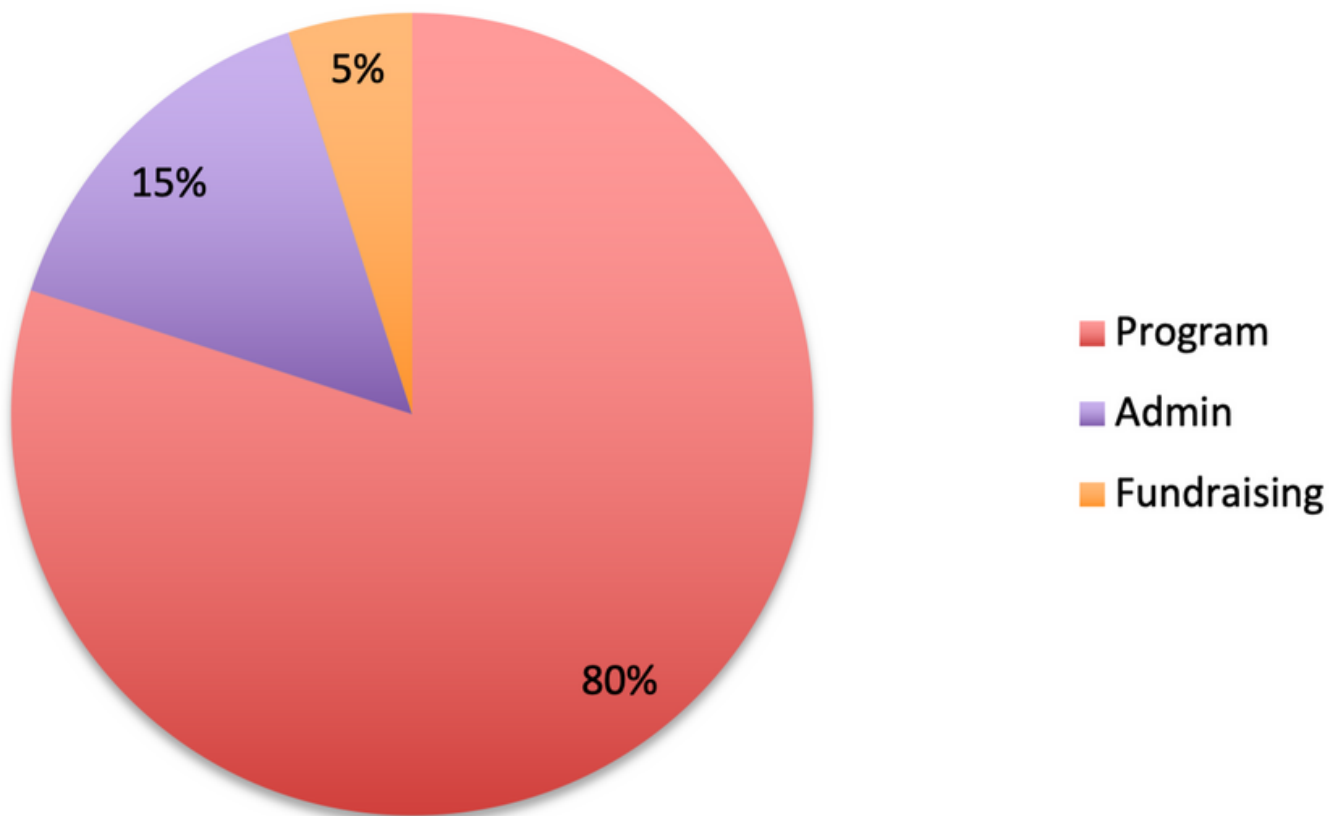
Financials

One of our core values is transparency, and we embody this by publishing our financial reports every quarter.

You can find those reports here:

<https://freebsdoundation.org/about-us/about-the-foundation/financials/>

2021 Spending Breakdown



2 M

TOTAL BUDGET

If you have any questions regarding the financial reports, please contact deb@freebsdoundation.org.

Fundraising in 2021

Thank you to all the individuals and organizations who gave us a financial contribution in 2021. It shows you value the work we are doing supporting FreeBSD and that you trust in how we will invest your money in the Project.

Without your donations, we couldn't have grown our team which enabled us to increase the support we provided to more areas of FreeBSD. We are a 501c3, public charity, for the public good. In addition, we are 100% funded by donations from individuals and organizations like yours.

We are so grateful to have reached our goal of \$1,250,000. In total, we raised \$1,281,437! On behalf of the Foundation, I want to thank you for your financial support last year, that will help us continue and increase our support for FreeBSD in 2022.

Why do we need this much money? In 2020, we made a decision to increase our software development efforts and make more significant software contributions to FreeBSD. In order to do that, we had to grow our team. We developed a technology roadmap from input we were receiving from individual and commercial users, as well as market trends. Based on the roadmap, we identified positions we needed to fill.



in 2021, we hired three full-time software developers, one full-time Arm kernel developer, and one project manager. In addition, we are funding wifi work full-time and some other projects to help improve FreeBSD on the desktop. Our growth wasn't just in our technology team, but in our advocacy team too. We hired a marketing coordinator and technical writer to provide more educational and informational content.

Throughout this report, you'll see all the work we did to promote FreeBSD, as well as provide community engagement, education opportunities, and informative content to help pave the path to getting started with FreeBSD.

With these additional resources we've been able to step in more often to implement and improve major features in FreeBSD, review patches and bug reports, implement bug fixes, and support the security efforts. This helps keep FreeBSD the innovative, secure, and reliable operating system you rely on. It also allows us to provide more documentation to assist new and seasoned FreeBSD contributors to get the information they need.

Fundraising in 2021

For more specific information on what your donations allowed us to do, read through this Impact Report where you'll find reports from the various areas we support.

Also, please remember that we are completely funded by donations and your support will help us directly improve FreeBSD through:

Operating System Improvements: Providing staff to immediately respond to urgent problems and implement new features and functionality allowing for the innovation and stability you've come to rely on.

Security: Providing engineering resources to bolster the capacity and responsiveness of the Security team providing you with peace of mind when security issues arise.



Quality Assurance: Improving and increasing test coverage, continuous integration, and automated testing with a full-time software engineer to ensure you receive the highest quality, secure, and reliable operating system.

New User Experience: Improving the process and documentation for getting new people involved with FreeBSD, and supporting those people as they become integrated into the FreeBSD Community.

Training: Supporting more FreeBSD training for undergraduates, graduates, and postgraduates. Growing the community means reaching people and catching their interest in systems software as early as possible. More training provides job seekers an additional set of in-demand skills and employers a bigger pool of skilled candidates.

Face-to-Face Opportunities: Facilitating collaboration among members of the community, and building connections throughout the industry to support a healthy and growing ecosystem and make it easier for you to find resources when questions emerge.

I know we say it a lot, but we truly can't do it without you. Please consider [making a donation](#) to help us continue and increase our support for FreeBSD.

In addition, don't forget about our [Partnership Program](#)! It provides additional benefits for our larger commercial donors. Find out more information and share with your companies!

Advocacy in 2021

From promoting work being done by others with FreeBSD and producing advocacy literature to helping make contributing to the Project easier and attending or producing FreeBSD events, a large part of our efforts are dedicated to advocating for the Project. Take a look at what we did in 2021.

Events:

While we were only able to attend one in-person event this past year, we were still able to sponsor, present and organize 22 events in 2021 including the June 2021 FreeBSD Developer Summit and the November 2021 FreeBSD Vendor Summit. Videos from the Summits can be found on the Project's [YouTube channel](#).



Webinars, How-To Guides, and Blogs:

We continued our popular [FreeBSD Fridays](#) program with sessions on an Introduction to BastilleBSD, How to Submit a Patch to FreeBSD, How to Track FreeBSD Using Git, Part 1 and the Writing Scholar's Guide to FreeBSD. We look forward to continuing the series in 2022. In addition to the FreeBSD Fridays Series, our What's New in FreeBSD 13.0 video was our most watched video of 2021.

We also added new How-To and Quick Start guides to help folks get started using FreeBSD. These guides include a [Contributing FreeBSD Documentation](#), [How to Submit a Bug Report](#), [Contributing to FreeBSD as a Programmer](#), [Printing on FreeBSD](#), and [Updating FreeBSD From Git](#).

From our [Technology Roadmap](#) to the [Status of Online Conference Software](#) on FreeBSD, our blogs gave you a snapshot of the latest software development work, showed you what was working on FreeBSD, and introduced you to some of the new folks working on the Project. Check out what you might have missed [here](#).

FreeBSD Journal

We're also very proud to say that you can still access the FreeBSD Journal for Free. Being able to bring all of the informative articles to the community at no cost to the reader is just one of the ways we're continuing to advocate for the Project. We've also made it easier to access individual articles. If you haven't read it yet, please [take a look](#) and share with your friends and colleagues.

Advocacy in 2021

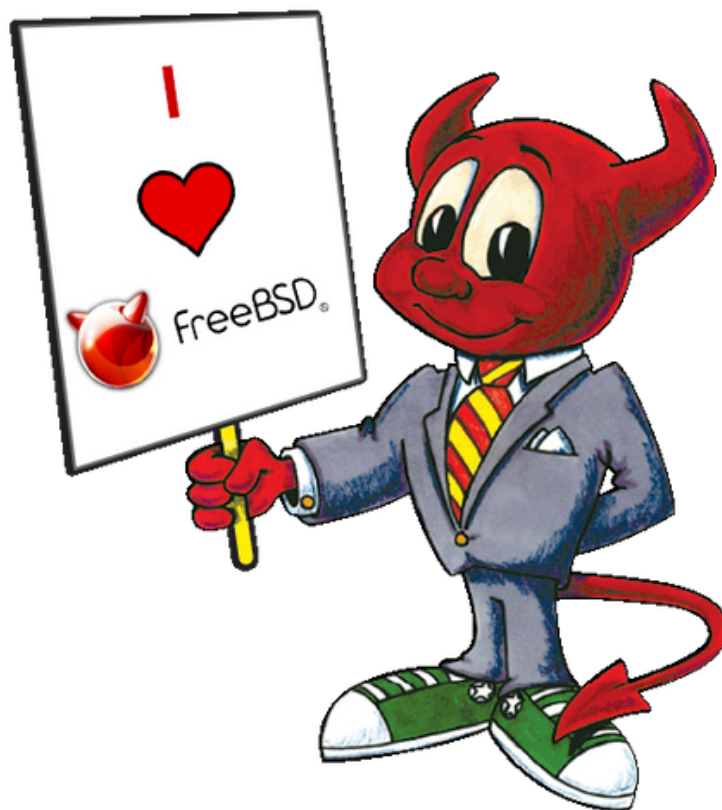
Newsletter and Quarterly Status Reports

In 2021, we took a bit of a hiatus on the FreeBSD Foundation newsletter, but it made a comeback this [Fall](#). We did, however, continue to send entries to the FreeBSD quarterly status reports. Both are an excellent way to find out about upcoming grant and CFP submission deadlines, get ongoing updates from our software development team, and find out more about where we're going and where we've been to promote FreeBSD around the world. If you haven't yet signed up to receive updates from us, please do so at the bottom of this page. A full list of what we've accomplished by quarter can be found [here](#).

New Staff:

Drew Gurkowski joined us as a marketing coordinator and a new technical writer will be making their FreeBSD debut at the end of the year.

As you can see, the Foundation advocacy team had a very productive 2021 in spite of everything. We were able to grow the team and accomplish so much this year, in part, because of the financial support from the FreeBSD community. Your commitment to the Project is truly inspiring.



Infrastructure Support in 2021

The Cluster Administration Team provides many services, such as ensuring that the Project's equipment is running reliably. With such an essential role, the FreeBSD Foundation contributes to Cluster Administration by purchasing and helping to maintain hardware to support the FreeBSD infrastructure.

Here are some of the purchases made in the last couple of years to support the Cluster Administration team and the Project:

- SSD backed pkg and Git mirror for US east coast
- New servers to run the cgit web interface
- Web server to host web sites (www, docs, cgi, and ftp-sync)
- New web servers to run the FreeBSD Bugzilla instance and the wiki. Due to the old hardware, both sites were often timing out. This has been resolved with the new servers.
- New web server to hosts reviews.freebsd.org and some other web services
- New server to host the Git repository
- Two new servers for expruns. These are high-core-count systems necessary for testing package builds.
- New FTP and pkg mirror for Malaysia
- Four new Ampere eMAG pkg builders for arm64 packages
- Reference servers. These are host jails that FreeBSD committers can access to test src and ports on arm64. This was required for arm64 becoming a tier1 platform for FreeBSD 13.0.
- New server to build freebsd-update for arm64.

The Foundation also supports the cluster administration with human resources. Li-Wen Hsu, a full-time employee of the Foundation, is an active member of the Cluster Administration Team.



Software Development in 2021

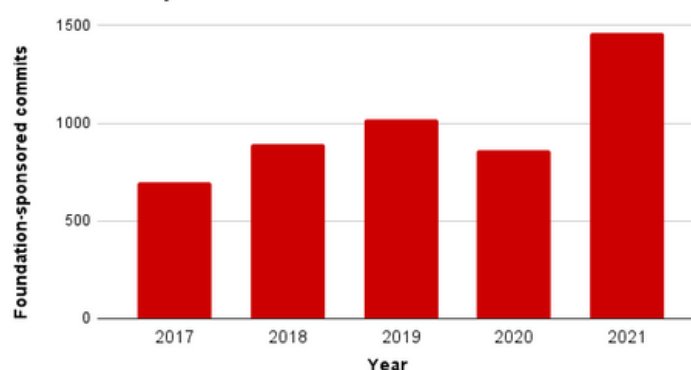
The FreeBSD Foundation added to our technical staff this year to increase our sponsored development, while continuing grant funding for individual projects.

In 2021 Foundation staff and grant recipients made 1468 sponsored commits to the src tree, 42 to the doc tree, and 163 to the ports tree. This represents a growth over 2020 of 70%, 37%, and 75% respectively.

Staff

We started the year with a technical staff of three, and finish with eight full-time technical staff members and contractors. We also had two co-operative education students from the University of Waterloo join us for the Spring 2021 term.

Foundation-sponsored commits vs Year



As usual staff supported the project with bug triage and fixes, supported security advisories and errata updates, participated in code reviews to help contributors make submissions to FreeBSD, supported ongoing operational needs of the project, and developed a number of features and improvements.

Staff focus areas in kernel development included virtual memory, x86 pmap, uma, tmpfs, nullfs, ffs and ufs, debugging, kqueue and POSIX timers, and job control improvements. User space work included changes to the libc, libcasper, and libthr libraries, the run-time linker, as well as the ldd, cmp, diff, makefs, elfctl, growfs, and bhyve utilities.

Git Transition

Foundation staff members Li-Wen Hsu and Ed Maste assisted with the migration of the FreeBSD source code repositories from Subversion to Git. A significant portion of this project was completed in 2010, but the ports tree conversion took place at the beginning of this year. We continued to work on some improvements including updates to the repository commit hooks, and continue to investigate and test permissively-licensed Git-compatible tools which may be suitable for inclusion in the base system.

Continuous Integration:

The Foundation supports FreeBSD's continuous integration effort through hardware donations and Li-Wen's leadership of the CI team. Li-Wen keeps the CI infrastructure up-to-date, including adapting to the Project's migration to Git, and performs a significant amount of test result triage, investigating reported issues and coordinating with the appropriate committer.

Software Development in 2021

Syzkaller and Kernel Sanitizers:

Syzkaller is an automated code-coverage-guided system call fuzzer, which is very effective at finding inputs to provoke and identify kernel bugs. This year Mark Johnston contributed significantly to FreeBSD support in Syzkaller, and triaging and fixing many of the issues it found.

Related work includes the kernel sanitizers KASAN (kernel address sanitizer) and KMSAN (kernel memory sanitizer). These features combine Clang compiler support with a runtime component to detect invalid operations at runtime. They may be used directly by developers and provide value there, but are very useful in detecting issues via CI tests, and in improving Syzkaller's effectiveness.

Vulnerability Mitigations:

Over the years Foundation staff have implemented various vulnerability mitigations. These include proactive mitigations for bugs in applications, as well as software mitigations for CPU speculative execution issues. We added a write-XOR-execute mapping policy, and extended the elfctl tool to make it easier for the ports infrastructure to use across supported FreeBSD releases. We also supported developers from Semihalf with their goal of starting to enable these features by default.

64-bit Arm architecture:

Andrew Turner joined our team this year, allowing us to increase our support for arm64 (or AArch64), the 64-bit Arm architecture. This year the FreeBSD core team promoted FreeBSD/arm64's to Tier-1 status, and Andy's work with the Foundation will support that.

Andy has added support for ISA-specific instructions and optimizations (such as SHA256), and extended indirect function (IFUNC) dispatch support to statically linked binaries. Work is in progress on RAS (Reliability, Availability and Serviceability) extensions. Two security enhancements, Pointer Authentication (PAC) and Branch Target Identification.

Improved amd64 UEFI boot

Konstantin Belousov modified the amd64 UEFI loader to start the kernel from the "staging area" without first copying it aside. Previously the kernel had to be copied to a fixed location, which was incompatible with some UEFI firmware implementations and had other limitations. This work addressed a number of outstanding issues in the FreeBSD problem report (bug) database.

VFS Path Descriptors:

The UNIX VFS API has traditionally supported two types of operations. One operates on paths and manipulates metadata - removing or renaming files, changing permissions, and so on. The other operates on data - for example, read, write, or truncate.

Software Development in 2021

These operations use a file descriptor (fd) as a handle to the opened file, and importantly once opened the handle is decoupled from the filename – the file may even be deleted, but data operations may continue on the fd. UNIX historically provided no API for performing all metadata operations using a similar handle. One consequence is that certain operations could fundamentally not be made race-free; it was impossible to guarantee that the underlying file was not changed between two path-based metadata operations.

Linux extended the API with a facility to make path references possible, and Kostantin added a broadly compatible implementation to FreeBSD. This work adds the `O_PATH` flag to `open(2)` which does not actually open the file for access, but just acts as a reference to the filesystem object. The Samba SMB/CIFS server will make use of the new functionality – details are available in [Samba's Wiki](#). Details on use of path descriptors can be found in the `open(2)` man page.

OpenSSH Updates:

FreeBSD includes a copy of OpenSSH in the base system. Toward the end of this year Ed updated base system OpenSSH, from 7.9p1 to the then-latest version, 8.7p1, followed by an update to 8.8p1. Ed also enabled support for FIDO/U2F hardware security keys. You can read more about this work in the security report.

Prototype Installer:

Over the summer Foundation co-op student Yang Zhong built a prototype of an updated FreeBSD installer, building on initial work by Ryan Moeller. The experiment uses a web front-end which allows for a user friendly graphical install process. The installation may even be controlled by a browser on a different computer. This work was featured in [Hackaday](#). Although not integrated into FreeBSD the Foundation will continue with this experimental effort.

Containerization:

Foundation co-op student Cyril Zhang worked on some container-and virtualization-related tasks over the summer. This included work to add resource accounting (RACCT) support to the [runj](#) OCI-compatible Jail runtime. This included a number of RACCT bug fixes and minor improvements, and the addition of subsystem tests. Phabricator reviews (for FreeBSD changes) and a GitHub pull request (for runj) are in progress for this work.

Cyril also worked on improving bhyve, with the primary effort changing the bhyve VM lifecycle to allow better user and jail integration.

Although Cyril's work term is over, Foundation staff will continue to work on both of these projects.

Software Development in 2021

Intel WiFi driver support

To expand and improve FreeBSD wireless support, the Foundation has contracted Bjoern Zeeb (bz) to work on an Intel Wireless driver project. In the current phase of the project, the aims are to provide support for newer Intel chipsets and to update the mac80211 LinuxKPI compat code. The dual-licensed Intel driver code was ported in the past for the iwlm(4) native driver and using the LinuxKPI compat framework allows porting the driver directly with only very minor modifications. Multiple updates during the past year have shown that pulling in newer versions can be done in under 1-2 hours.

The Intel wireless driver and firmware are now regularly synchronized with upstream, so that we will have support for all modern cards currently supported on GNU/Linux. Some iwlwifi driver changes were also submitted back upstream. Several conflicts with the original implementation of LinuxKPI have been resolved and more LinuxKPI code was upstreamed to the FreeBSD main branch. After LinuxKPI 802.11 compat code was improved, data packets are going over 11a. Firmware crashes have been resolved and the 802.11 compat code was improved. The iwlwifi driver and firmware were updated from the iwlwifi-next git branch and the linux-firmware repository. For the latest state of development, follow the freebsd-wireless mailing list.

Small Feature Enhancements and Other Work:

Foundation staff contributed many more small feature enhancements and improvements, including:

- [nvlist-based audio device enumeration](#)
- Performance monitoring counter (libpmc) infrastructure improvements and support for additional CPU types
- Resource accounting (RACCT) bug fixes and improvements
- Building FreeBSD 13.0 images for Microsoft Azure
- Adding “[hole-punching](#)” APIs to remove a portion of an existing file (making it sparse)
- Improving the Microchip LAN743x driver and adding it to the default build
- Significantly improving rename support in the msdosfs(5) FAT filesystem driver
- sort(1) performance improvements



Software Development in 2021

Grants

Linuxulator application compatibility:

Linux binary compatibility allows running unmodified Linux binaries under FreeBSD without the use of virtual machines, but by providing Linux binaries with kernel interfaces identical to those of the Linux kernel. To update and improve the Linux compatibility layer, the Foundation awarded grants to Edward Tomasz Napierala (trasz@). The most recent work focused on ensuring Linux compatibility was ready for the 13.0 release, updating the Linux kernel interface to version 3.17.0, and allowing more unmodified Linux binaries to be executed on FreeBSD. The status of specific Linux applications is tracked at the Linux app status wiki page.

LLDB CPU target support, userland debugging, and kernel debugging support:

A debugger with kernel debugging capabilities is a critical tool for OS development. The FreeBSD base system includes LLDB, the debugger component of the LLVM project. To improve LLDB on FreeBSD, the Foundation contracted Moritz Systems. Some of the recent enhancements include porting LLDB support to the modern client-server model on all architectures, implementing support for tracing fork(2) and vfork(2) syscalls with follow-fork-mode compatibility from GDB, improving support for core dumps, and improvements for interfacing with other servers implementing the GDB remote protocol. Fork tracing makes it possible to debug child processes. Upon fork, the debugger can either continue tracing the parent and detach the child, or switch to tracing the child and detach the parent. It also prevents software breakpoints from leaking to child processes and causing them to crash. The newly introduced PT_COREDUMP ptrace(2) allows creating a core dump of a stopped program without crashing it. The remote protocol work included fixing issues when interfacing with GNU GDB and QEMU's gdbserver implementations and adding support for debugging executables running on gdbserver architectures other than amd64. Moritz's work also involved fixing many bugs, improving the state of the test suite on amd64 and arm64, improving the LLDB API, and reducing code duplication.

Online RAID-Z expansion:

RAID-Z expansion is a long-requested ZFS feature that will allow users to add disks one at a time to a RAIDz vdev. This feature can be especially useful for small pools. For example, when there isn't sufficient hardware to add storage capacity via a whole new RAID-Z vdev, disks can be added to a 3-disk RAIDz1, to make it a 4-disk, then 5-disk, etc. RAIDz1 vdev. The FreeBSD Foundation contracted Matt Ahrens to implement RAID-Z expansion and the work is to be integrated into the OpenZFS repository with support for FreeBSD and Linux. The current state of the project is that it is functionally complete and a pull request has been opened. Remaining work includes code cleanup, design documentation, and addressing test failures.

Software Development in 2021

Adapting OpenCrypto for WireGuard:

WireGuard is a secure tunneling protocol with both userland and kernel implementations. After an initial flurry of bug fixes, the FreeBSD kernel wireguard codebase is more complete and stable. Automated CI is now set up for each commit, compiling and running a small smoke test on wireguard-freebsd's supported releases.

The Foundation is sponsoring John Baldwin to work on wireguard by updating the data path crypto in the upstream WireGuard driver to use the in-kernel OpenCrypto Framework for the data path. Data packets sent over a WireGuard tunnel are encrypted with the Chacha20-Poly1305 AEAD cipher. Unlike TLS and IPsec, Wireguard uses an 8 byte nonce rather than a 12 byte nonce with this cipher.

To date, most of the work has focused on updating OCF to better support multiple nonce (and tag/MAC) lengths for a given cipher. John had previously begun work aimed at supporting all of the AES-CCM NIST KAT vectors, many of which use non-default nonce and tag lengths. The approach has been refined to better fit the existing OCF model where nonce and MAC lengths are properties of a session (similar to key lengths). (An earlier branch had made the nonce length a property of individual operations instead.) This mostly entailed extending the /dev/crypto interface to permit setting these parameters for a session. Existing tests for OCF run in userland and use the /dev/crypto interface including both the cryptocheck utility and the NIST KAT vector tests.

Building upon these framework changes, John extended the existing Chacha20-Poly1305 cipher in OCF to support both 8 and 12 byte nonces including in the accelerated openssl(4) driver. A patch against the upstream WireGuard FreeBSD driver to make use of this for the dataplane has been verified to interoperate with the stock WireGuard driver.

Future work will focus on upstreaming the OCF changes as well as additional review of the upstream WireGuard driver.



Continuous Integration in 2021

FreeBSD uses a restless continuous integration (CI) system to detect and address bugs sooner and, more generally, improve software quality. To maintain this important system, the FreeBSD Foundation funds projects related to CI and a full-time staff member, Li-Wen Hsu, to lead the Project's CI effort. Regular tasks include examining failing builds and unstable tests and working with developers to fix flagged code and adjust the test infrastructure.

The CI system has helped developers and contributors detect many bugs and regressions and address them before new releases. The artifacts built by the CI system are publicly available and help downstream users and developers do further tests with the latest code.

In 2021, there were many important changes in the CI system:

- All jobs were updated to use git following the VCS migration
- All doc jobs were updated following the AsciiDoc migration
- The results from build and test jobs of the main branch (-CURRENT) on amd64 are now sent to the dev-ci mailing list

New test jobs for deeper testing and analysis include:

- TCP test suite for -CURRENT on amd64
- GCC 9 build for -CURRENT on amd64
- Run regression test suite with KASAN enabled for -CURRENT on amd64
- Run regression test suite with KMSAN enabled for -CURRENT on amd64

Finally, Li-Wen has been working with the workflow working group and release engineering on:

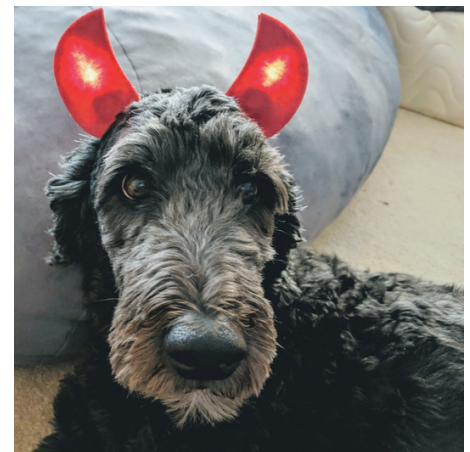
- Designing and implementing the system for pre-commit CI building and testing
- Designing and implementing use of CI cluster to build release artifacts as release engineering does currently

Looking Ahead to 2022

The beginning of a new year is always exciting! It feels like our opportunity to start refreshed and reenergized to kick off new projects and goals, while continuing to work on projects we started last year. I feel that excitement for our team, and am also looking forward to continuing to follow the growth plans we put together in 2021. As you read in some of the other reports, we significantly grew our team in 2021. We also put together a Technology Roadmap. Now we will continue the forward momentum by implementing the roadmap, increasing our FreeBSD advocacy and training, and providing the increased number of resources for various needs of the Project.

Our team began 2022 following the plans and goals we developed in early 2021, and we will update them if needed after our strategic planning board meeting in early February.

This includes improving FreeBSD on the desktop, support for Arm as a Tier 1 architecture, containerization, and improve developer tools. As mentioned above, in addition to the software work, we will increase FreeBSD advocacy work and include new opportunities for the community to connect and learn.



Special appearance by some of the #DogsofFreeBSD

Last But Not Least



I want to give a heartfelt thank you to our staff and board members for all their hard work over the past year. The board is made up of a diverse group of volunteers, who provide their unique skills and expertise to support our efforts in various ways and are responsible to help provide strategic direction, accountability, and governance to the Foundation. Our staff members are located around the world, who are passionate about FreeBSD, and contribute in various ways to support the work we are doing to make FreeBSD the best operating choice and community. I am starting 2022 reenergized, helping to guide our team in supporting the FreeBSD Project and community in new and exciting ways.

Finally, I'd be remiss if I didn't thank the individuals and organizations that supported us financially in 2021. We are 100% funded by your donations, and with these donations, were able to meet our 2021 goal. I also want to give a big shout out and thank you to the thousands of folks who volunteer on the Project and contribute in so many different ways from documentation, advocacy, tutorials, to writing code.

Thank you! 2022 here we come!

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