

Editorial Board

- John Baldwin • FreeBSD Developer and Chair of FreeBSD Journal Editorial Board
- Tom Jones • FreeBSD Developer, Internet Engineer and Researcher at the University of Aberdeen
- Ed Maste • Senior Director of Technology, FreeBSD Foundation and Member of the FreeBSD Core Team
- Benedict Reuschling • Vice President of the FreeBSD Foundation Board and a FreeBSD Documentation Committer
- Mariusz Zaborski • FreeBSD Developer

Advisory Board

- Anne Dickison • Marketing Director, FreeBSD Foundation
- Justin Gibbs • Founder of the FreeBSD Foundation, President of the FreeBSD Foundation, and a Software Engineer at Facebook.
- Daichi Goto • Director at BSD Consulting Inc. (Tokyo).
- Allan Jude • CTO at Klara Inc., the global FreeBSD Professional Services and Support company.
- Dru Lavigne • Author of *BSD Hacks* and *The Best of FreeBSD Basics*.
- Michael W Lucas • Author of more than 40 books including *Absolute FreeBSD*, the *FreeBSD Mastery* series, and *git commit murder*.
- Kirk McKusick • Treasurer of the FreeBSD Foundation Board, and lead author of *The Design and Implementation* book series.
- George Neville-Neil • Past President of the FreeBSD Foundation, member of the FreeBSD Core Team, and co-author of *The Design and Implementation of the FreeBSD Operating System*.
- Hiroki Sato • Director of the FreeBSD Foundation Board, Chair of Asia BSDCon, Member of the FreeBSD Core Team, and Assistant Professor at Tokyo Institute of Technology.
- Robert N. M. Watson • Director of the FreeBSD Foundation Board, Founder of the TrustedBSD Project, and University Senior Lecturer at the University of Cambridge.

S&W PUBLISHING LLC

PO BOX 3757 CHAPEL HILL, NC 27515-3757

Publisher • Walter Andrzejewski
walter@freebsdjournal.com

Editor-at-Large • James Maurer
jmaurer@freebsdjournal.com

Design & Production • Reuter & Associates

Advertising Sales • Walter Andrzejewski
walter@freebsdjournal.com
Call 888/290-9469

FreeBSD Journal (ISBN: 978-0-615-88479-0) is published 6 times a year (January/February, March/April, May/June, July/August, September/October, November/December).
Published by the FreeBSD Foundation,
3980 Broadway St. STE #103-107, Boulder, CO 80304
ph: 720/207-5142 • fax: 720/222-2350
email: info@freebsd.foundation.org

Copyright © 2021 by FreeBSD Foundation. All rights reserved. This magazine may not be reproduced in whole or in part without written permission from the publisher.

LETTER
from the Foundation

FreeBSD/arm64 is Now Tier 1

Arm's 64-bit architecture, AArch64, is now Tier 1 status in FreeBSD 13. Following from the 32-bit FreeBSD/arm we use the name "arm64."

Tier 1 means that the FreeBSD release engineering team will build and publish official releases for this architecture, in addition to the existing amd64 and i386. The security team supports the architecture with binary and source updates for vulnerabilities and errata updates. A full set of binary packages is available from the package team.

Arm publicly disclosed the details of the AArch64 architecture in October 2011, and Andrew Turner soon took an interest in a FreeBSD port. The FreeBSD Foundation began supporting the arm64 porting effort in 2014, with funding from Arm and Cavium. Collaborating with Andrew and Semihalf, Cavium's ThunderX processor was brought up as the first reference platform for FreeBSD/arm64. The Foundation contributed work on release engineering, tool chain support, and other areas.

Support continued improving over the years, but it took a confluence of factors to allow for the promotion to Tier 1.

Early on Hardware availability was limited, especially for server class machines. Today Ampere Computing eMAG and Altra CPUs, Arm's Neoverse N1 core, and AWS Graviton instances are well-supported. The Foundation purchased eMAG servers to build official package sets. Ampere Computing then donated additional servers. This allowed the project to support multiple simultaneous FreeBSD src and ports tree branches.

The tool chain was an early limiting factor. FreeBSD still used an older version of the GNU linker which did not support arm64, requiring awkward workarounds to use an out-of-tree linker. With Foundation sponsorship, the project migrated to using LLVM's LLD linker for all supported architectures in FreeBSD 13.

Thanks to tireless contributions from FreeBSD ports volunteers we were able to iterate on arm64 build failures; over 30,000 packages are now available.

In April 2021 on behalf of the core team I announced that FreeBSD/arm64 would be Tier 1 in FreeBSD 13.

I hope you enjoy the arm64 articles in this issue, and give FreeBSD/arm64 a try!

Ed Maste

Senior Director of Technology
FreeBSD Journal Editorial Board