

svn UPDATE

by Steven Kreuzer

Over the past few years we have started to see an increased interest in ARM, a family of reduced instruction set computing (RISC) processors. The explosion in popularity can be partly attributed to inexpensive, single-board computers such as the BeagleBone and Raspberry Pi, which are providing folks with a simple yet extremely powerful platform to experiment on. In production environments, IT professionals are also looking toward ARM to help scale their infrastructure while simultaneously attempting to reduce power and cooling costs.

We are starting to see ARM powering everything from phones and tablets to high-performance computing environments, and I expect its footprint to grow as the Internet enables our couches to tweet and refrigerators to friend your blender on Facebook.

While ARM is still not a Tier 1 platform, every day we are seeing massive amounts of work being done to improve ARM64 support from both hobbyist developers and companies with commercial interests in building ARM-based appliances with FreeBSD at the core. In addition to all that, a brand new IO scheduler has been committed along with several changes that increase ZFS performance and give you more control over how hard a user or process can hit your storage pools. If that wasn't enough support for Haswell, GPUs were recently introduced that now enable FreeBSD to provide improved graphics and better battery life on a wide range of laptop configurations.

New CAM I/O scheduler—

<https://svnweb.freebsd.org/changeset/base/298002>

This is a new scheduler that favors reads over writes and has the ability to throttle the write throughput to SSDs. This new scheduler also brings in NCQ TRIM support for those SSDs that support it. In addition to better catering to read-heavy workflows, this new scheduler keeps a lot more statistics than the default scheduler, which can be useful for knowing when a system is saturated and needs to shed load. At this time, it is not the default scheduler and there may still be some rough edges, but it has been in use at Netflix for over a year.

I/O Limits on ZFS—

<https://svnweb.freebsd.org/changeset/base/297633>

Four new resources—`readbps`, `readiops`, `writebps`, and `wriops`—have been added to `rctl` that now allow you to set limits on disk i/o for a process, user, login class, or jail. This should be a welcome addition to any system administrator who has to share a machine with IOP-intensive applications or users.

Improved ZFS speculative prefetch of indirect blocks—

<https://svnweb.freebsd.org/changeset/base/297832>

Scalability of many operations on a wide ZFS pool can be limited by the requirement to prefetch indirect blocks first. Recently added asynchronous, indirect block read partially helped, but did not solve the problem completely. This change extends existing prefetcher functionality to explicitly work with indirect blocks. Before this change, prefetcher issued reads for up to 8MB of data in advance. With this change, it also issues indirect block reads for up to 64MB of data in advance, so that when it is time to actually read those data, it can be done immediately.

ARM64 copyinout improvements—

<https://svnweb.freebsd.org/changeset/base/297209>

Making use of wider load/stores when aligned buffers are being copied has introduced a massive performance boost on FreeBSD/arm64. Performing a simple test of using `dd` to copy 1G from `/dev/zero` to `/dev/null` shows an increase from 410MB/s to 3.6GB/s.

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Implement GELI in gptboot and gptzfsboot— <https://svnweb.freebsd.org/changeset/base/296963>

You may have noticed that the boot loader got a little fatter recently. Support for booting off GELI encrypted UFS and ZFS partitions was recently added. Additional details on how this was implemented can be found in a paper Allen Jude presented at AsiaBSDCon 2016.

Support for boot-time DTrace— <https://svnweb.freebsd.org/changeset/base/297773>

It is now possible to enable DTrace probes relatively early during boot before `dtrace(1)` can be invoked on `i386` and `amd64`. The desired enabling is created using `dtrace -A`, which writes a `/boot/dtrace.dof` file and uses `nextboot(8)` to ensure that DTrace kernel modules are loaded and that the DOF file describing the enabling is loaded by `loader(8)` during the subsequent boot. The trace output can then be fetched with `dtrace -a`.

Support tracing of userspace applications on ARM64— <https://svnweb.freebsd.org/changeset/base/297611>

The `dtrace_getupcstack`, which allows the function call stack to be captured, has been ported over to ARM64. This allows you to use DTrace to probe userspace applications.

Updated i915 GPU Driver— <https://svnweb.freebsd.org/changeset/base/296548>

Recently the FreeBSD graphics team undertook a massive initiative to update the i915 GPU driver to match Linux 3.8.13. The most exciting feature of this update is that it now brings support for Haswell GPUs to FreeBSD.

ARM64 kernel address space increased to 512GB— <https://svnweb.freebsd.org/changeset/base/297914>

This change, which also increases the DMAP region, has also been increased to 2TiB.

Support for 4 level pagetables on ARM64— <https://svnweb.freebsd.org/changeset/base/297446>

The userland address space has been increased to 256TiB.

Add kern.features flags for linux and linux64 modules— <https://svnweb.freebsd.org/changeset/base/297597>

To help third-party applications determine if the host supports linux emulation, a new `kern.features` flag has been introduced for linux and linux64 modules. If `kern.features.linux` is equal to 1, then 32-bit Linux binaries are supported, and if `kern.features.linux64` is set to 1, 64-bit binaries are supported.

Updates to head/contrib

The base FreeBSD userland is made up of quite a few utilities, some of which are developed outside of the project. In the past few months we've seen a few updates to the third-party software that help create a great user experience.

- **bmake has been upgraded to version 20160307— <https://svnweb.freebsd.org/changeset/base/297357>**
- **byacc has been upgraded to version 20160324— <https://svnweb.freebsd.org/changeset/base/297276>**
- **libxo has been upgraded to version 0.6.1— <https://svnweb.freebsd.org/changeset/base/298083>**

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