



Contents

Ampere's Support for Open-Source Firmware	1
TianoCore/EDK2.....	1
Enabling EDK2 on Ampere Platforms	2
Engagement with the EDK2 Community	2
LinuxBoot	2
Ampere's EDK2 Repositories	2
LinuxBoot Repository for Mt. Jade	3
OpenBMC.....	3
Enabling OpenBMC on Mt. Jade	3
Engagement with the OpenBMC Community	3
Ampere's OpenBMC Repository	3
OpenOCD	4
Enabling OpenOCD on Ampere Platforms.....	4
Engagement with the OpenOCD community	4
Ampere's OpenOCD Repository	4

Ampere's Support for Open-Source Firmware

Open-source firmware is critical to the datacenter ecosystem, and server customers expect these solutions to work seamlessly on their platforms. Given this, Ampere is committed to supporting open-source firmware on its platforms. In this white paper, we'll discuss how Ampere meets this need through its support for TianoCore/EDK2, LinuxBoot, OpenBMC and OpenOCD.

All firmware in this post has been enabled for Ampere's Altra® SOC (<https://amperecomputing.com/altra/>) on the Mt. Jade reference platform (<https://amperecomputing.com/altra/#jade>).

The software can be found at either <https://github.com/AmpereComputing> and <https://github.com/ampere-openbmc>

TianoCore/EDK2

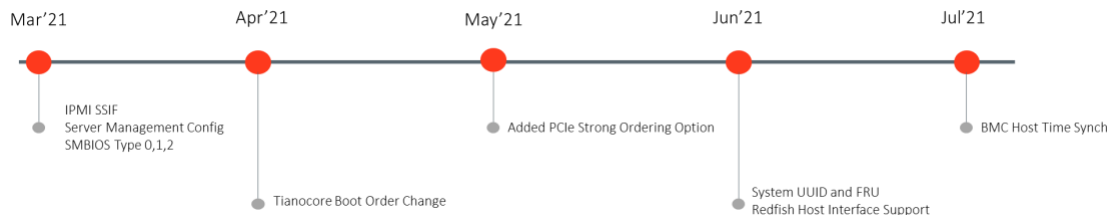
Over the past few years, the legacy BIOS (Basic Input Output System) is being replaced by UEFI (Unified Extensible Firmware Interface (UEFI) mechanism. UEFI offers significant benefits in terms of extensibility and has been widely adopted by all the platform vendors. EDK2 is the open-source implementation of the UEFI standard. The upstream repo can be found at <https://github.com/tianocore/edk2>.



AMPERE®

Enabling EDK2 on Ampere Platforms

As shown below, Ampere is committed to contributing at a frequent (monthly) cadence towards EDK2 opensource software. The software is proven out on Ampere Altra Cloud Native processor and Mt. Jade dual socket platform prior to being released. Ampere will continue to introduce new features and add enhancements to the software release.



Engagement with the EDK2 Community

Ampere's EDK2 solution is currently forked from the main repository and is stored in Ampere's public GitHub repository. We are in the process of upstreaming our changes, having completed our second submission cycle with the maintainers. We will start a third round shortly and hope to complete the upstream process by end of Q3.

As Ampere continues to push forward with new SOCs and related features, we expect to take a leadership position in enabling new EDK2 Arm64 features.

LinuxBoot

LinuxBoot (<https://www.linuxboot.org/>) is an open-source effort to replace certain UEFI stages with a Linux kernel and runtime. Just as Ampere supports the EDK2 boot flow, we are committed to supporting this method as well. In our current implementation, the UEFI boot-flow is maintained until the BDS phase. Instead of jumping into the UEFI shell, our LinuxBoot implementation transitions to the LinuxBoot kernel and runtime, eventually launching the eventual operating system.

The recipe to construct the Mt. Jade-specific kernel and runtime is part of the LinuxBoot GitHub and is maintained by Ampere engineers. The recipe consists of a Mt. Jade-specific kernel config and Makefile. The Makefile pulls the Linux source from Linus' tree and builds it using the kernel config. The Makefile additionally pulls and builds open-source Go packages to generate the u-root runtime.

Ampere's LinuxBoot implementation is included in our EDK2 GitHub repository, with plans to upstream as a 'step 2' after our EDK2 solution has fully merged.

Ampere's EDK2 Repositories

<https://github.com/AmpereComputing/edk2>

<https://github.com/AmpereComputing/edk2-platforms>

<https://github.com/AmpereComputing/edk2-ampere-tools>

<https://github.com/AmpereComputing/edk2-non-osi>



AMPERE®

LinuxBoot Repository for Mt. Jade

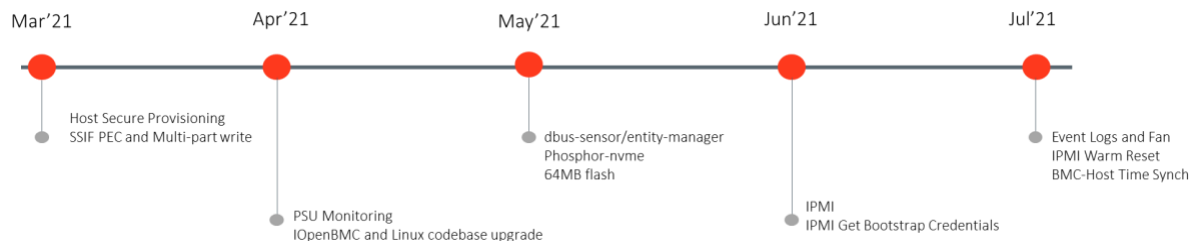
<https://github.com/linuxboot/mainboards/tree/master/ampere/jade>

OpenBMC

OpenBMC is a Linux Foundation open-source project for Baseboard Management Controller firmware¹ (<https://github.com/openbmc>).

Enabling OpenBMC on Mt. Jade

Ampere has enabled OpenBMC for the Mt. Jade Platform, which uses the ASPEED AST2500 Baseboard Management Controller. Like the EDK2 effort, Ampere has a regular, monthly release cadence. The following picture captures the contributions towards the OpenBMC initiatives.



Ampere's patches are available at [Ampere's OpenBMC repository](#). The patches are split into three areas:

- openbmc/meta-ampere: Ampere's OpenBMC implementation for Mt. Jade
- linux: Linux drivers to communicate with Ampere platform microcontrollers and a bmc-ssif driver port for Mt. Jade
- ssifbridge: Ampere's SSIF Bridge implementation

Engagement with the OpenBMC Community

Ampere is steadily upstreaming its patches to the OpenBMC repository. Baseline meta-ampere patches and ssifbridge are now upstream, with the remaining meta-ampere patches in-progress. Additional Linux driver upstream are in-progress.

Ampere's OpenBMC Repository

<https://github.com/ampere-openbmc>

¹ <https://github.com/openbmc>



OpenOCD

OpenOCD (<http://openocd.org/>) is open-source software for on-chip debugging, in-system programming and boundary-scan. OpenOCD is essentially software for JTAG debugging, which is a critical tool for firmware development and debug.

Enabling OpenOCD on Ampere Platforms

Ampere has done significant work on OpenOCD by adding features to support both the ARMv8 architecture and Ampere Altra/Mt. Jade specifically. Examples of the general Armv8 support include implementing Armv8 register access, improving instruction-step support ('aarch64-steponly on' option) and ADiv6 DAP support.

For Ampere Altra/Mt. Jade, Ampere is particularly proud of the BMC remote debug feature, which enables the use of the BMC as a JTAG device, similar to a physical probe plugged into a JTAG debug port. In the field, a user can simply use the BMC interface to use debug a system with OpenOCD. The BMC code is already available in Ampere's OpenBMC repository.

Engagement with the OpenOCD community

As an example of true open-source collaboration, our engineers worked with Mellanox engineers to develop the watchpoint feature. Engineers from both companies were developing this feature independently, and upon learning about the other party, worked together to create a mutually agreeable solution.

Ampere's changes are available on [Ampere's OpenOCD repository](#) and are steadily being upstreamed to the main repo (<http://openocd.zylin.com/>).

Ampere's OpenOCD Repository

<https://github.com/AmpereComputing/ampere-openocd>

Redistributable Firmware Binaries

In addition to the open-source projects, Ampere will soon regularly make its proprietary firmware binaries both publicly available and freely redistributable. By doing so, a complete firmware solution will be available for Ampere platforms.