



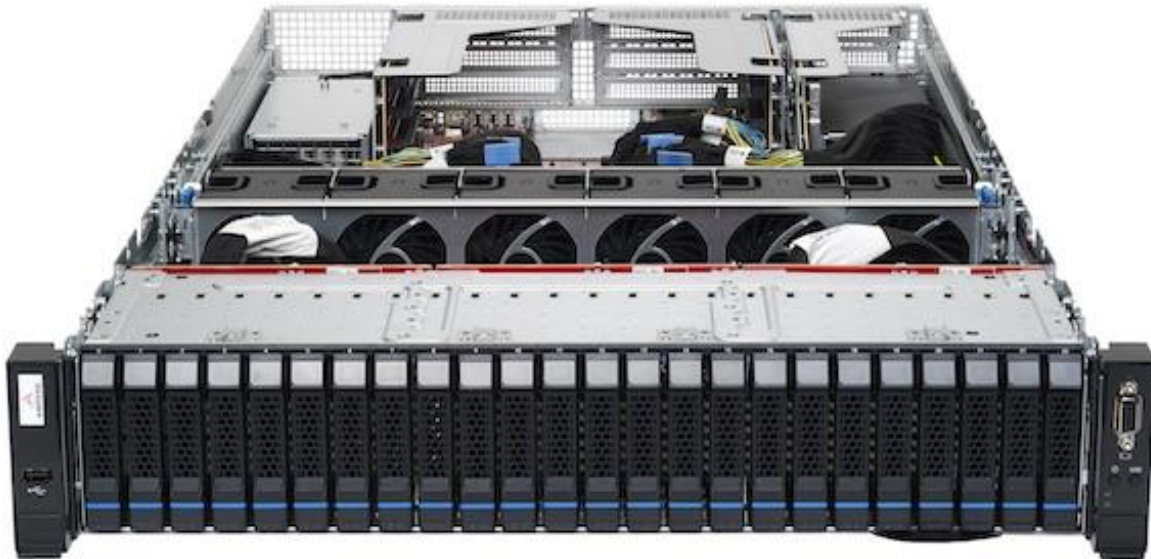
# Open-Source Firmware Status on Ampere<sup>®</sup> Platforms

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# Get to Know Ampere®!

- Ampere is a passionate, experienced team committed to building the next generation ARM64 server processors targeted for the cloud and edge. Founded and led by Renee J. James, previously from Intel.
- Headquartered in Santa Clara with offices around the world: Portland, Raleigh, Bangalore, Ho Chi Minh City, Taipei and Shanghai
- Key Dates
  - October 2017: Ampere founded.
  - November 2018: Introduced Ampere® eMAG®: 16nm, Arm v8.0, 32-core 3.3GHz server processor
  - March 2020: Introduced Ampere® Altra®: 7nm, Arm v8.2+, 80-core 3.0GHz server processor for 1P and 2P platforms.
  - Feb 2021: Presents Open-Source Firmware Status at FOSDEM 2021.

# Ampere Mt. Jade Platform



- 2P/2U reference platform for Altra
- <https://amperecomputing.com/altra/#jade>

# Ampere's Support for Open-Source Firmware

- Ampere is committed to supporting open source in the firmware ecosystem.
  - Enable open-source FW on Ampere platforms
  - Active engagement with the community
- Firmware Projects
  - TianoCore/EDK2 & LinuxBoot
  - OpenBMC
  - OpenOCD
  - OCP/OSF Efforts
- Ampere's GitHub: <https://github.com/AmpereComputing>

# TianoCore/EDK2

- Support for Altra on Mt. Jade
  - Currently forking TianoCore/EDK2 to Ampere's GitHub
  - Monthly release cadence, latest release is v1.03.100
  - Upstream to main repo in progress. v1 reviewed, v2 to be submitted. Targeting completion by end of March.
- Beginning support for Ampere Altra Max in March 2021

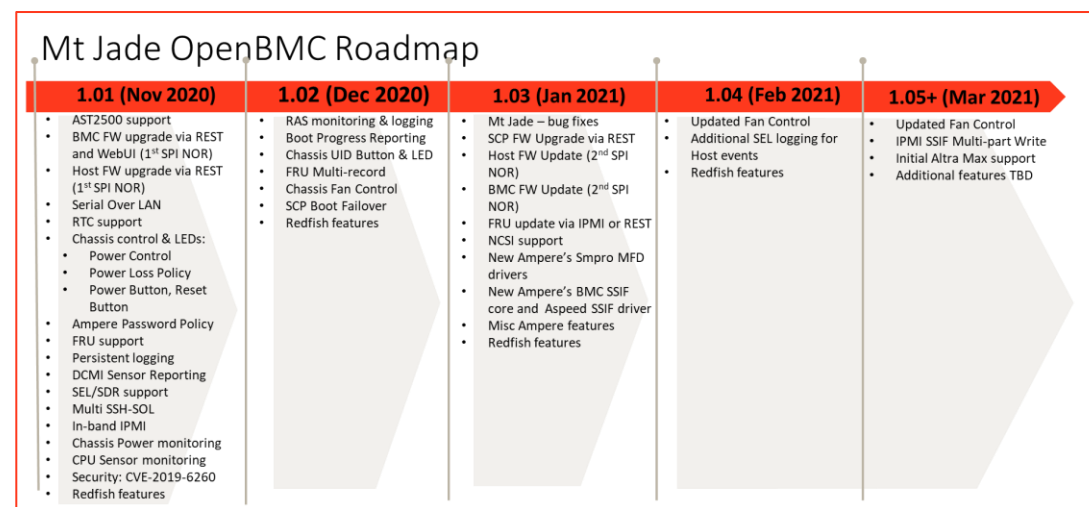
1.01 (Nov 2020)	1.02 (Dec 2020)	1.03 (Jan 2021)	1.04 (Feb 2021)	1.05+ (Mar 2021)
<ul style="list-style-type: none"><li>• Secure Flash/Secure boot</li><li>• Variable Runtime Service</li><li>• UEFI Capsule Update</li><li>• OS Capsule Update</li><li>• ACPI tables</li><li>• SMBIOS</li><li>• Console Redirection</li><li>• Aspeed VGA</li><li>• IPv4/IPv6</li><li>• Boot from PXE/HTTPS/NVMe/SATA</li><li>• CPU/PCIe/DDR Config</li><li>• SubNUMA Config</li><li>• RAS (SDEI, APEI/EINJ)</li><li>• Native PCIe OptionROM</li><li>• Built-In LinuxBoot</li></ul>	<ul style="list-style-type: none"><li>• Boot Progress Report</li><li>• LinuxBoot integration framework</li><li>• PCIe Power Management</li></ul>	<ul style="list-style-type: none"><li>• NVMe Hotplug</li><li>• BERT support</li><li>• PCIe Power Management</li><li>• Boot Options Restored</li></ul>	<ul style="list-style-type: none"><li>• TPM 2.0</li><li>• PCIe MPS/MRR</li><li>• NVDIMM support</li></ul>	<ul style="list-style-type: none"><li>• IPMI SSIF</li><li>• Server Mgmt Config</li><li>• Boot Order change</li><li>• Initial Altra Max support</li><li>• Additional features TBD</li></ul>

# LinuxBoot

- What is LinuxBoot
  - <https://www.linuxboot.org/>
  - *LinuxBoot is a firmware for modern servers that replaces specific firmware functionality like the UEFI DXE phase with a Linux kernel and runtime. Improves boot reliability and boot time.*
  - Old idea, but somewhat new in servers.
- Ampere's Support
  - Ampere EDK2 GitHub has a build option enabling LinuxBoot, which replaces the BDS shell with LinuxBoot & u-root UI.
  - Will be working to integrate LinuxBoot into EDK2 upstream.
  - LinuxBoot executable built directly from the GitHub repo (<https://github.com/linuxboot/mainboards/tree/master/ampere/jade>)

# OpenBMC

- Support for Mt. Jade
  - <https://github.com/ampere-openbmc>
  - **openbmc/meta-ampere**: Ampere’s implementation for Mt. Jade
  - **linux**: Linux kernel changes (including Ampere’s SM Pro MFD drivers and Ampere’s bmc-ssif driver)
  - **ssifbridge**: Ampere’s SSIF Bridge implementation
  - Monthly release cadence, latest release is v1.03.100
- Upstreaming status
  - Base **meta-ampere** and **ssifbridge** upstreamed
  - Additional code under meta-ampere continues to be upstreamed over time
  - SM Pro MFD drivers to be upstreamed for review Feb 2021
  - ssif-bmc driver to be upstreamed for review Feb 2021



# OpenOCD

- OpenOCD is a free software on-chip debugging, in-system programming and boundary-scan test tool for various ARM, MIPS and RISC-V systems. <http://openocd.org/>

## Ampere Contributions for ARM 64-Bit

- ARMv8 system register access
- Improved instruction step support (OpenOCD 'aarch64 steponly on' option)
- ADIV6 DAP including Class 9 ROM Table large physical addressing 64-bit AXI access
- Watchpoints (Co-developed with Mellanox)

## Ampere Contributions for Altra & Mt. Jade

- OpenBMC/OpenOCD BMC Remote Debug of target server system
- SMpro (AArch32), PMpro (AArch32) & ARMv8 (AArch64) DAPs
- Ampere eMAG, Altra and Altra Max OpenOCD board and target configuration files
- Ampere Altra Life-Cycle-State (LCS) support

- Code is slowly merging upstream, but otherwise available on Ampere's GitHub
  - <http://openocd.zylin.com/>
  - <https://github.com/AmpereComputing/ampere-openocd>



# OCP/OSF Efforts

- The OCP Open System Firmware project's purpose is to allow platform owners to “own their firmware”. One of the central compliance requirements is that firmware be open-source (code) or freely redistributable (binaries).
- Ampere will be working towards certifying our Mt. Jade firmware to be OCP/OSF compliant in the next few months. Much of the stack is already open-source and Ampere is working to make the relevant binaries publicly redistributable.
- At the end of this process, the firmware components for Mt. Jade will be available from OCP's website.
- Link: <https://www.opencompute.org/projects/open-system-firmware>

# Ampere Open-Source Firmware Links

EDK2	<a href="https://github.com/AmpereComputing/edk2">https://github.com/AmpereComputing/edk2</a> <a href="https://github.com/AmpereComputing/edk2-platforms">https://github.com/AmpereComputing/edk2-platforms</a> <a href="https://github.com/AmpereComputing/edk2-ampere-tools">https://github.com/AmpereComputing/edk2-ampere-tools</a> <a href="https://github.com/AmpereComputing/edk2-non-osi">https://github.com/AmpereComputing/edk2-non-osi</a>
OpenBMC	<a href="https://github.com/ampere-openbmc">https://github.com/ampere-openbmc</a>
OpenOCD	<a href="https://github.com/AmpereComputing/ampere-openocd">https://github.com/AmpereComputing/ampere-openocd</a>
LinuxBoot	<a href="https://github.com/linuxboot/mainboards/tree/master/ampere/jade">https://github.com/linuxboot/mainboards/tree/master/ampere/jade</a>

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