

OPEN POSSIBILITIES.

Arm & Ampere support for
standards-based Open Source
Firmware



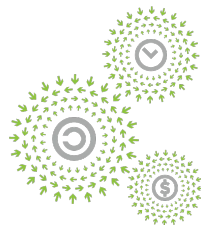
OCP
GLOBAL
SUMMIT

NOVEMBER 9-10, 2021

Arm & Ampere support for standards-based Open Source Firmware

Samer El-Haj-Mahmoud, Sr Principal Architect, Arm
Peter Pouliot, Developer Advocate, Ampere Computing

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PLATINUM™

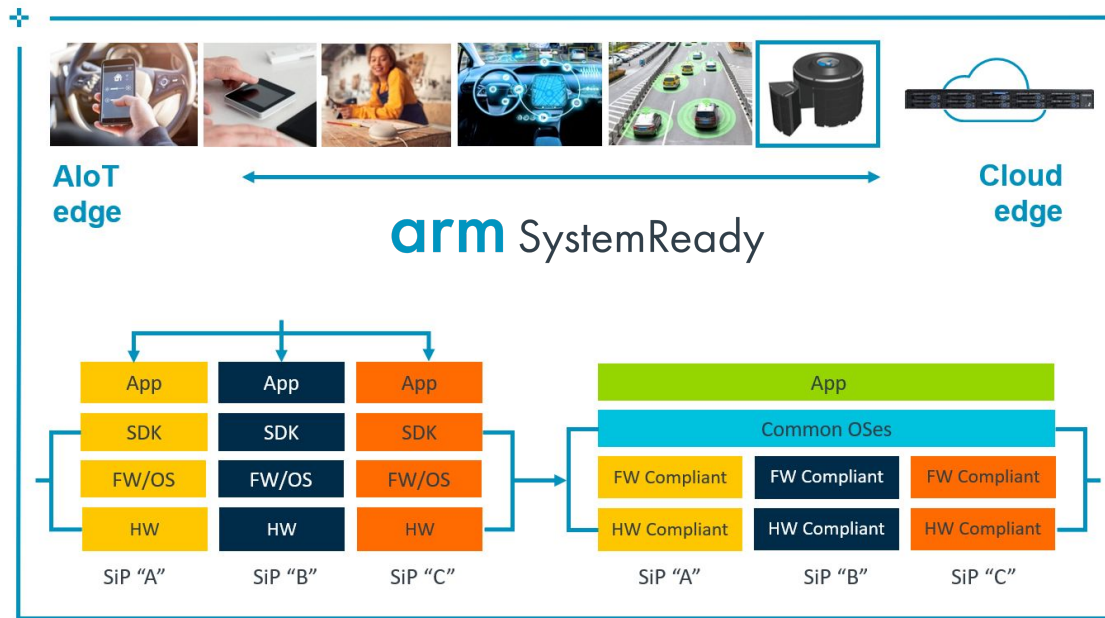


arm SystemReady

Vision: "Software Can Just Work on Arm-based Devices"



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Arm SystemReady Vision



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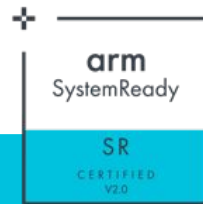
LS



"Just Works" for Linux OSES on Arm server SoCs

- Program tailored to meet needs of many hyperscalers
- Ensures standard firmware interfaces to deploy and maintain
- Targets hyperscalers' Linux environment

SR



"Just Works" on Arm server or workstation SoCs

- Program tailored to meet needs of Windows, VMware, Linux, and BSD ecosystem
- Ensures standard firmware interfaces to deploy and maintain
- Supports old OSES to run on new hardware and vice versa
- Targets generic off-the-shelf OSES

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Arm SystemReady standards



OPEN SYSTEM FIRMWARE



Hardware requirements (BSA – Base System Architecture)

- **BSA v1.0 (Oct 2020)** – generic hardware target
- Documents a minimal set of CPU and system architecture necessary for an OS to boot and run. Includes aspects such as PCIe integration.



Server Hardware Supplement (SBSA)

- **SBSA:** Servers market segment specific hardware requirements
- Mostly follows the Arm architecture enhancements
- SBSA v7.0 (Jan 2021)



Firmware (BBR – Base Boot Requirements)

- Expands to include common firmware interfaces, but recognizes that different software stacks will require different recipes
- BBR v1.0 (Oct 2020)
- SBRR, EBBR, LBBR Recipes targeting different OSes

<http://www.arm.com/systemready-certification-program>

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Arm Server Management Standards



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- **SBMR** – Server Base Manageability Requirements
<https://developer.arm.com/documentation/den0069/>
- Hardware and Firmware requirements for standard system management of Arm SystemReady SR or LS compliant servers.
- Co-developed with the Arm Servers ecosystem partners, with leadership from Ampere® Computing.
- Builds on top of prevalent management standards:
 - DMTF Redfish
 - DMTF MCTP, PLDM, SPDM, NC-SI
 - OCP Hardware Management
 - IPMI



Redfish



- IPMI -

Intelligent Platform Management
Interface Specification
Second Generation
v2.0

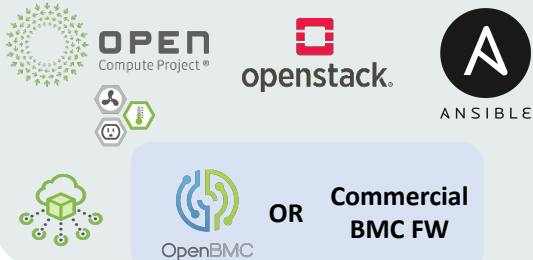
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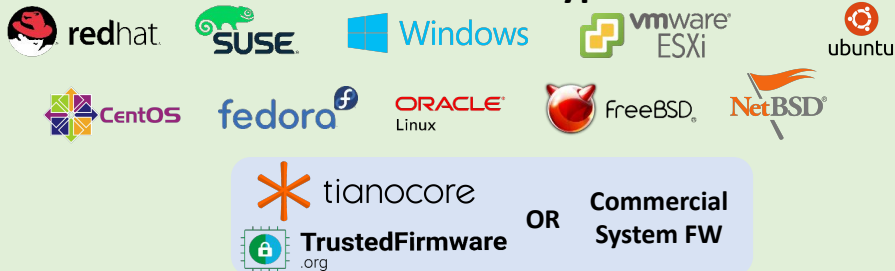
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Arm Standards-based server design

Standard HW Management



Standard OSes and Hypervisors



Arm Server Standards

SBMR

arm SystemReady

SBSA

BSA

BBR

BBSR

Industry Standards



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Ampere® Altra®: The First SystemReady SR Server Platform!



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Company	Ampere Computing
System	Mt. Jade Platform
SoC family	Ampere Altra 64-bit Multi-Core Arm processor
Firmware version	OACOI 1.01.20200923
ACS version	Enterprise ACS v2.5
BSA details	SBSA level 4
BBR details	SBBR (BBR 1.0)
Arm SystemReady certification	SystemReady SR v2.0
Tested operating systems	• Windows PE (from Windows ADK for Windows 10, version 2004) • Ubuntu 20.04 • Centos 8 • Debian 10 (buster)

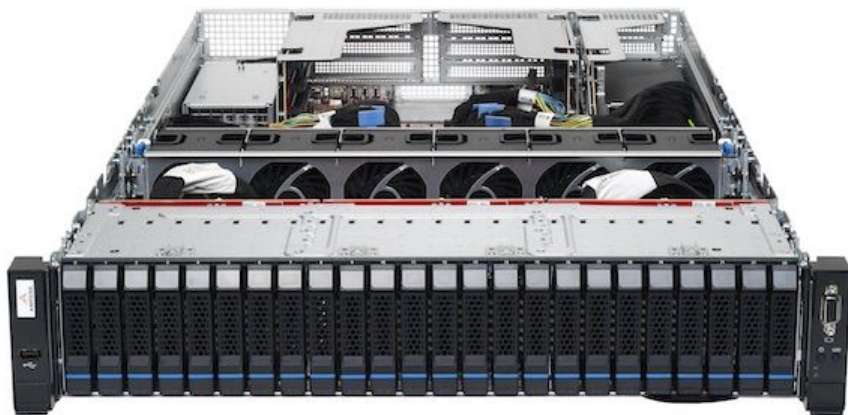
<https://developer.arm.com/architectures/system-architectures/arm-systemready/sr>

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Ampere® Mt. Jade Platform

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



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OPEN
Compute Project
SOLUTION PROVIDER®



Ampere® Support for Open-Source Firmware

Ampere is committed to supporting open-source in the firmware ecosystem

- Enable open-source firmware on Ampere platforms
- Active engagement within the community

Firmware Projects

- TianoCore/EDK2 & LinuxBoot
- OpenBMC
- OpenOCD
- OCP/OSF Efforts

Ampere Github: <https://github.com/AmpereComputing>

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Ampere® OCP/OSF Efforts



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- 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>

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Arm and TianoCore

- TianoCore is an open-source community project with implementations of Firmware standards: UEFI, PI, ACPI, SMBIOS, TCG, UEFI Shell, etc..
 - Including support for Arm SBBR specification
- Growing Arm community (maintainers, contributors)
 - Complete and partial Arm64 platforms, silicon drivers, libraries, and support code
- <https://github.com/tianocore/>:
[edk2](#) , [edk2-platforms](#) , [edk2-non-osi](#) , [uefi-sct](#)



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TianoCore/EDK2



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Support for Ampere® Altra® on Mt. Jade

- Ampere is committed to contributing at a frequent (monthly) cadence towards TianoCore/EDK2 opensource software
- Latest release is v1.07.300
- <https://github.com/AmpereComputing/edk2-platforms/releases/tag/v1.07.300-ampere>

*Began support for Ampere® Altra Max
in March 2021*



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Arm and LinuxBoot



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Arm ecosystem working on defining LBBR

(LinuxBoot Base Requirements) for Arm servers

- Foundation for Arm SystemReady LS class of servers
- Leveraging existing Arm server approach to fully open-source firmware
- Demos and PoCs on multiple arm platforms, including FVP, QEMU, RPi 4, as well as production offering from Ampere® (Mt Jade)



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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.

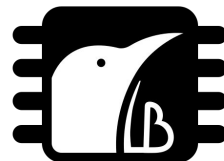
Ampere® Support

- 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>)

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SERVER



LinuxBoot



Arm and OpenBMC

- <https://www.openbmc.org/>
- Collaborative project for an open source BMC firmware stack
- Arm is on the OpenBMC Technical Steering Committee (TSC)
- Participating in upstream activity, enabling Arm specific PoC and SBMR functionality on OpenBMC
 - SBMR explicitly calls out OpenBMC for illustrating implementation guidance
 - MCTP/PLDM sensors and RAS error logging support for the Arm Side-Band Management Interface
 - Arm Remote Debug sample implementation using OpenBMC and OpenOCD

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OpenBMC



OpenBMC



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Support for Mt. Jade

- <https://github.com/ampere-openbmc/openbmc/meta-ampere> : Ampere® 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 v1.10.100

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 - pending
- ssif-bmc driver to be upstreamed for review - pending



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Ampere Open-Source Firmware Links



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EDK2

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

OpenBMC

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

OpenOCD

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

LinuxBoot

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

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Call to Action

- How to get involved in Arm SystemReady
- www.arm.com/systemready-certification-program
- Visit Ampere and Arm booths and sessions @ OCP Global Summit 2021!



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Visit Ampere @ OCP 2021

Booth (B13)

- Demos: Ampere® AI, CIDR, Android in the Cloud
- Platforms on display

Keynote Nov 9 @ 9:34 am PST

- Renee James, Ampere CEO:
A New Era with Efficient Cloud-Native Processors: Open Collaboration for Rapid Innovation

Talks

- 11/9 @ 2:30pm Expo Hall Talk
- 11/9 @ 3:30pm Executive Talk – Jeff Wittich CPO
- 11/10 @ 9:30 am Tech Talk:
The Era of Cloud Native platforms is here - presenting the Ampere Mt. Jade reference platform running Ampere Altra Max CPUs
- 11/10 @ 4pm Tech Talk:
Arm and Ampere Support for Standards-Based Open System Firmware

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Visit Arm @ OCP 2021

Booth (B11)

- **Demos: Arm SystemReady Certified Hardware**
 - Arm SystemReady, SR – ServerReady:
 - **Ampere Altra ‘Mt Jade’ Platform (Wiwynn)**
 - Arm SystemReady, ES – Embedded Server:
 - **Hawkeye Tech HK-6010**
 - **SolidRun Macchiatobin**
 - Arm SystemReady, IR – IoT:
 - **Raspberry Pi**

Talks

- Wed, Nov 10 @ 8:35am Room 211A-D
Cost Modeling Analysis for Heterogeneous Integration of Chiplets, Javier DeLaCruz (Arm), Mudasir Ahmad (Google), Anu Ramamurthy (Microchip Technology)
- Wed, Nov 10 @ 10:00am Room 220C
Confidential Compute Solutions in Arm Ecosystem, Sridhar Valluru (Arm)
- Wed, Nov 10 @ 1:00pm Room 210C
Introduction to Open System Firmware (OSF) at OCP, Dong Wei (Arm), Ryan O’Leary (Google), Anjaneya “Reddy” Chagam (Intel)
- Wed, Nov 10 @ 2:30pm Room 210BF
Arm and Ampere support for Standards-based OpenSource Firmware, Samer El-Haj-Mahmoud (Arm), Peter Pouliot (Ampere)

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Thank you!



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