Arm SystemReady Requirements Specification v1.2

Document number: DEN0109C

Arm SystemReady Requirements Specification

Release information

The Change History table lists the changes made to this document.

Table 1-1 Change History

Date	Issue	Confidentiality	Change
6 Oct 2020	A	Non-Confidential	Arm SystemReady Requirements Specification version 1.0
27 April 2021	B	Non-Confidential	Arm SystemReady Requirements Specification version 1.1 • Updated requirements for SystemReady SR v2.0, ES v1.0 and IR v1.0 • Reformatted the guidance for possible requirements for future versions • Renamed “security option” to “security extension” • Removed the Pre-silicon Certification as Pre-silicon is an enabler and tool not a requirement or certification program • Added waiver levels for SystemReady ES and IR • Added certification process flow chart
19 Oct 2021	C	Non-Confidential	Arm SystemReady Requirements Specification version 1.2 • Updated requirements for SystemReady SR v2.1, ES v1.1, and IR v1.1 • Updated the guidance for possible requirements for future versions • Renamed the “Security Extension” to “Security Interface Extension” • Added certification process for the updated and derivative devices

Contents

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1 INTRODUCTION

Systems that are designed to "just work" for the end user (with the ability to install and run generic off-the-shelf operating systems out-of-the-box) need to follow a set of minimum hardware and firmware requirements to ensure compatibility.

For hardware, the Arm SystemReady Program defines a common Base System Architecture (BSA) specification and a set of market specific supplements. For example, the Server Base System Architecture (SBSA) supplement specification is for the server segment. The common BSA contains only the bare minimum requirement to deploy an operating system. The BSA is a baseline. Therefore, there is no limit on differentiation and the special features that can be built atop the base platform. The platform can be adapted to meet the market need.

For firmware, the program has added additional boot recipes – a recipe meaning a set of requirements - to accommodate the different standards and implementations that are used in a broader ecosystem. The recipes SBBR, EBBR and LBBR are described in the Base Boot Requirements (BBR) specification. Arm may develop other recipes in the future, if necessary.

This specification describes the requirements for Arm SystemReady program.

2 ARM SYSTEMREADY PROGRAM

For the Arm SystemReady program, each market segment may target a different set of operating systems and hypervisors with different hardware and firmware requirements. We use the term band is used to identify these differences with an abbreviation for each band:

- SR for ServerReady
- LS for LinuxBoot Server
- ES for Embedded Server
- IR for IoT

Table 1 summarizes the specifications that the devices need to be compliant with.

Certification	Specifications		
SystemReady SR	BSA	SBSA	SBBR Recipe in BBR
SystemReady LS	BSA	SBSA	LBBR Recipe in BBR
SystemReady ES	BSA	-	SBBR Recipe in BBR
SystemReady IR	BSA	-	EBBR Recipe in BBR and Devicetree

Table 1: Arm SystemReady bands

SystemReady SR is technically identical to ServerReady and continues to bring the same benefits to the Arm server ecosystem. The additional bands in SystemReady, LS, ES, and IR, are designed to serve the needs of a broader silicon and software ecosystem. We define the bands in consultation with our partners, and we expect that all operating system distributions will find a band that adequately captures their basic requirements for a standards-based Arm platform.

All SystemReady bands will be supported by a common Architectural Compliance Suite (ACS) that is modular, to support testing against different combinations of specifications required by a SystemReady band.

SystemReady ES, and IR for 64-bit, have the same hardware requirements.

- SystemReady IR requires Devicetree support in addition to the reduced set of UEFI interfaces that are specified in the EBBR specification.
- SystemReady ES requires ACPI and SMBIOS interfaces, in addition to the UEFI interfaces.

SystemReady SR requires additional SBSA compliance for hardware and more stringent UEFI and ACPI requirements for firmware.

Systems that are certified as SystemReady SR meet the requirements for SystemReady ES. There is no need for these systems to be certified as SystemReady ES.

A 32-bit system can be certified as SystemReady IR if it supports devicetree and the EBBR specification. However, because the BSA specification does not cover 32-bit systems, we list the 32-bit systems separately from the 64-bit systems on the Arm SystemReady System Compatibility List (SCL).

2.1 SystemReady SR certification

2.1.1 SystemReady SR V2.1 requirements, Oct 2021 update

SystemReady SR v2.1 requires the certified devices to be compliant to the following specifications:

- BSA v1.0 and Level 3-6 as defined in SBSA Supplement v6.1.
- SBBR recipe in BBR v1.0.

To certify a device for SystemReady SR v2.1, results from running the existing Enterprise ACR v3.1 must be submitted. In addition, OS installation and boot logs are required:

- WinPE boot log is required.
- VMware ESXi-Arm installation and boot logs are recommended.
- Installation and boot logs from two of the Linux or BSD distros are required.

In choosing the Linux or BSD distros, maximize the coverage by diversifying the heritage. For example, the following shows the grouping of the heritage:

- Heritage: RHEL/Fedora/CentOS, or SLES/openSUSE, or Ubuntu/Debian, or CBL-Mariner, or NetBSD/OpenBSD/FreeBSD.

2.1.2 Future SystemReady SR requirements

In the future, requirements based on newer versions of the BSA/SBSA/BBR specifications may be added. In addition, installation and boot logs from VMware ESXi-Arm might be required.

2.2 SystemReady ES certification

2.2.1 SystemReady ES V1.1 requirements, Oct 2021 update

SystemReady ES v1.1 requires the certified devices to be compliant to the following specifications:

- BSA v1.0.
- SBBR recipe in BBR v1.0.

Waiver Levels 0-2 as defined in Appendix A are available.

To certify a device for SystemReady ES v1.1, results from running the SystemReady ES ACS v1.0 must be submitted. In addition, OS installation and boot logs are required:

- WinPE boot log is recommended.
- VMware ESXi-Arm installation and boot logs are required.
- Installation and boot logs from two of the Linux or BSD distros are required.

In choosing the Linux or BSD distros, maximize the coverage by diversifying the heritage. For example, the following shows the grouping of the heritage:

- Heritage: RHEL/Fedora/CentOS, or SLES/openSUSE, or Ubuntu/Debian, or CBL-Mariner, or NetBSD/OpenBSD/FreeBSD.

2.2.2 Future SystemReady ES requirements

In the future, requirements based on newer versions of the BSA/BBR specifications might be added. In addition, boot log from WinPE may be required. In addition, Security Interface Extension (See Section 3.1) might be required as an integral part of SystemReady ES as secure boot and secore firmware update features are critical to the edge and IoT deployment and maintenance. Waiver Levels 0-1 might be deprecated.

2.3 SystemReady IR certification

2.3.1 SystemReady IR V1.1 requirements, Oct 2021

SystemReady IR v1.1 requires the certified devices to be compliant to the following specifications:

- BSA v1.0 for 64-bit devices (only test reporting, no enforcement), no BSA requirements for 32-bit devices.
- EBBR recipe in BBR v1.0 (**Note:** EBBR recipe is based on the EBBR Specification 2.0.1.).
- Devicetree v0.3.

Waiver Levels 0-2 as defined in Appendix A are available.

To certify a device for SystemReady IR v1.1, results from running the SystemReady IR ACS v1.0 must be submitted. In addition, installation and boot logs from two of the Linux or BSD distros are required. The recommended distros are Fedora, Debian, Ubuntu, and openSUSE.

2.3.2 Future SystemReady IR requirements

In the future, requirements based on newer versions of the BSA/BBR specifications might be added. ESRT table for firmware update might be required. In addition, Security Extension (See Section 3.1) might be required as an integral part of SystemReady IR as secure boot and secore firmware update features are critical to the edge and IoT deployment and maintenance. Waiver Levels 0-1 might be deprecated.

2.4 SystemReady LS certification, under development

The SystemReady LS requirements and the SystemReady LS ACS are under development.

3 SYSTEMREADY OPT-IN EXTENSIONS

3.1 Security Interface Extension

The Arm SystemReady Program provides a Security Interface Extension for devices that are compliant to the UEFI Secure Boot and Secure Firmware Update through Capsule Update services. The requirements are specified in the Base Boot Security Requirements (BBSR) specification.

3.1.1 SystemReady Security Interface Extension requirements

SystemReady Security Extension requires the certified devices to be compliant to the BBSR Specification.

To certify a device for SystemReady Security Extension, results from running the ACS for Security Extension v1.0 must be submitted.

APPENDIX A SYSTEMREADY ES AND IR WAIVER LEVELS

Currently, most of the Arm SoCs targeting the embedded server and IoT markets are not BSA compliant. For existing SoCs targeting the embedded server and IoT markets, there are three possibilities for SystemReady ES and IR certification:

- Level 2 - Waiver: Like with any certification programs, some failures are expected. Waivers are granted, as long as the user experience of software "just works" is not impacted.
- Level 1 – Waiver and Workaround: Major failures may exist. However, the user experience of software "just works" can still be mostly achieved using hardware or firmware workarounds. Significant investments may be needed to provide the workaround.
- Level 0 – Waiver and OS Change: Major failures may exist, and hardware or firmware workarounds are not sufficient. OS changes or workarounds are needed. The user experience of software "just works" is impacted until the OS changes are contained in the future OS releases.

Level 0 waivers put the system at risk of compromising the SystemReady vision of software "just works". However, it is still important at this stage to fully understand the existing SoCs in their journey to be fully BSA compliant in the next generation. Devices with this class of failures can be certified at Level 0, if the required OS change or fix is available and meets the following requirements:

Linux / BSD

- Fix is up-streamed. For example, Linux kernel.org, or linux-next, or equivalent for BSDs.
- Fix is available and tested in a public distro build like:
    - Alpha / beta /development distro release
    - Nightly build, for example Fedora Rawhide, OpenSUSE Tumbleweed, Ubuntu Daily Build, Arch Linux kernel build

Windows and VMware ESXi, for SystemReady ES

- Fix applied by a driver, for example OSV, OEM, or community, that can be injected in the OS image during deployment or installation. Driver could be available as open-source or public binary.
- Fix confirmed by OSV and is available and tested in a public beta or pre-release build, for example Windows Insider Preview or VMware Fling

Table 2 describes some of the details of the SystemReady ES and IR waiver levels. These levels do not apply to SystemReady SR or LS:

Criteria	Level 0 – Waiver + OS Change	Level 1 – Waiver + Workaround	Level 2 – Waiver
Hardware BSA compliant?	No. Major failures, resolved with OS change	No. Major failures, resolved with workarounds	Mostly yes, some failures
Firmware BBR compliant?	Mostly yes. Some or no failures	Mostly yes. Some or no failures	Mostly yes. Some or no failures
Hardware or Firmware workarounds?	Not possible, or inadequate solution. An OS change is required instead.	Required, provide good solution	Not needed
Impacts "just works" goal?	Yes. Must be resolved with an OS change	With workaround, no impacts	No
Impacts user experience?	Yes. Must be contained with an OS change	With workaround, impacts are minimal or contained (with workaround)	Minimal or contained
OS changes needed?	Yes, required to enable "just works" goal and resolve user experience issues. Based on upstream or public OS builds.	Optional. OS changes can be used, for example, to remove the need for the workaround, add missing drivers or SoC support.	No
Existing OS distros work?	No, or less than two	Yes, two or more work with workaround	Yes, two or more, typically more
Future OS distros work?	Yes, some, two or more work with OS changes	Yes, most work with or without workaround	Yes, most
Future Hardware resolves issue?	Possible, not required. Partner committed to BSA	Possible, not required. Partner committed to BSA	Possible, not required. Partner committed to BSA
Waiver type	Public waiver issued to partner. Public errata describing issues and future path published on Arm SystemReady Certification List.	Public waiver issued to partner. Partner documentation of workarounds, public or NDA to end customers, are required.	

Table 2: SystemReady ES and IR waiver levels

Figure 1 shows a simplified summary of the SystemReady ES and IR waiver levels.

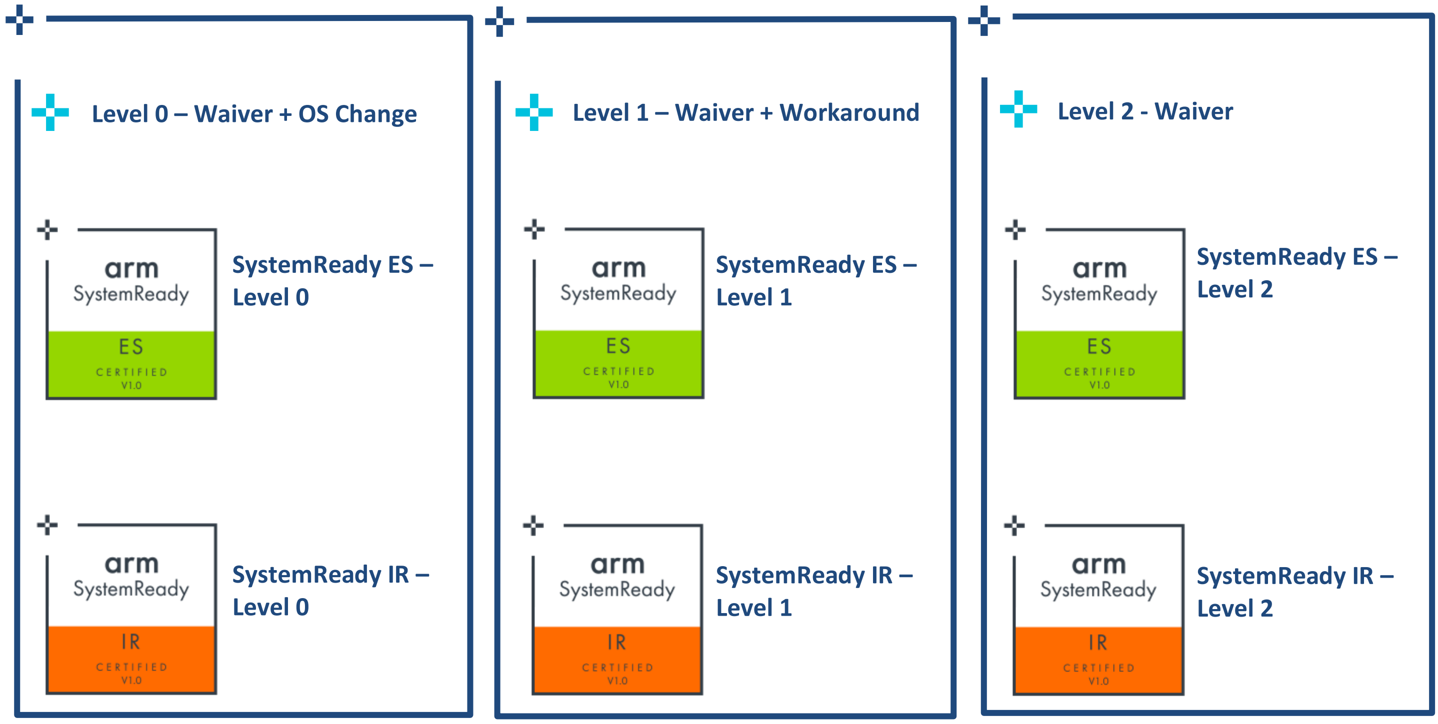


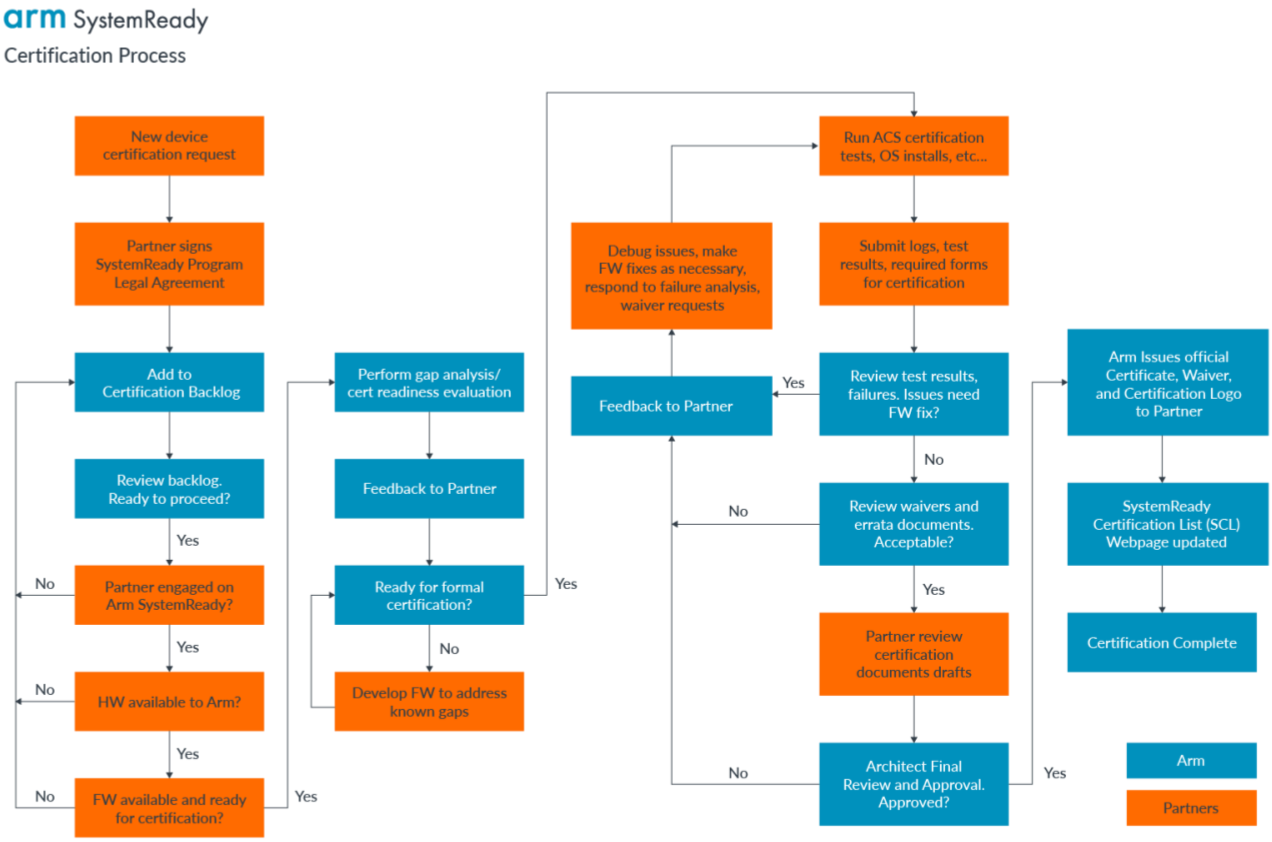
Figure 1: Summary of SystemReady ES and IR waiver levels

Time limit

The use of these levels will be time limited, with a requirement that any new certification submissions after these dates must be certified at a higher Level. The exact cutoff dates for Level 0 and Level 1 are to be determined.

APPENDIX B SYSTEMREADY CERTIFICATION PROCESS

The following flow chart illustrates the Arm SystemReady certification process from the initial certification request to the completion of the certification. This chart identifies the tasks and responsibilities that Arm and partners have throughout the process. Arm may use third party engineering services and test labs to strategically enable firmware development with partners, or to assist in the final certification phase. Arm is responsible for the architect final review and approval, as well as the final certificate issurance and publication.



The following flow chart illustrates the Arm SystemReady certification process from the updated or derivative systems. This chart might be updated as scenarios of updated or derivative systems are understood.