Arm SystemReady Certification

System Requirements Specification v2.0

arm SystemReady

Arm SystemReady Certification System 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
16 May 2022	D	Non-Confidential	Arm SystemReady Requirements Specification version 1.3 • Updated requirements for SystemReady SR v2.2 and ES v1.2 • Defined requirements for SystemReady LS v0.9 • Defined requirements for SystemReady Virtual Environment (VE) v0.5 • Created Appendix C exclusion to BSA for the ES and IR bands
28 Oct 2022	E	Non-Confidential	Arm SystemReady Certification System Requirements Specification version 2.0 • Updated requirements for SystemReady IR v1.2 & v2.0 ALPHA • Updated requirements for SystemReady Virtual Environment (VE) v1.0 • Updated requirements for SystemReady SR v2.3 and ES v1.3 • Renamed SystemReady LS v0.9 to SystemReady LS v1.0 ALPHA to be consistent with the IR version naming • Removed Appendix C exclusion to BSA for the ES and IR bands with the changes made to BSA 1.0c

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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 on 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 SBBR, EBBR and LBBR recipes 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 the 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 to identify these differences.

Table 1 summarizes the specifications that the devices need to comply 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 the previous ServerReady program 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.

SystemReady SR, ES, and IR bands are 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, but different firmware 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. SystemReady LS has the same hardware requirements as SystemReady SR, but

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supports the alternative firmware stack LinuxBoot, that uses Linux kernel as the Normal world firmware component.

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. Systems that are certified as SystemReady ES can also support many operating systems that SystemReady IR supports. There is no need for these systems to be certified as SystemReady IR unless they need to support an operating system that can only support Devicetree.

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 v2.3 requirements, Oct 2022 update

SystemReady SR v2.3 requires the certified devices to be compliant to the following specifications:

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

To certify a device for SystemReady SR v2.3, results from running the SystemReady SR ACS v1.1.0 must be submitted.

Note: Enterprise ACS v3.1 that was used in the SystemReady SR certification is deprecated.

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 distros or BSDs are required.

All logs must be submitted using the ES/SR template.

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

- Heritage: RHEL/Fedora/CentOS/AlmaLinux/Rocky Linux/Oracle Linux, 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, and BBR specifications may be added. In addition, installation and boot logs from VMware ESXi-Arm might be required. In addition, Security Interface Extension might be required as an integral part of SystemReady SR as secure boot, secure firmware update, and TPM support are critical to the server deployment and maintenance.

2.2 SystemReady ES certification

2.2.1 SystemReady ES v1.3 requirements, Oct 2022 update

SystemReady ES v1.3 requires the certified devices to be compliant to the following specifications:

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

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

To certify a device for SystemReady ES v1.3, results from running the SystemReady ES ACS v1.1.0 must be submitted. In addition, OS installation and boot logs are required:

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- Either the WinPE boot log, or VMware ESXi-Arm installation and boot logs, are required.
- Installation and boot logs from two of the Linux distros or BSDs are required.

All logs must be submitted using the [ES/SR template](#).

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

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

For those certified platforms shipped with a different firmware image than the one used for the certification, vendors must make the certified firmware image (binary) available to users, either through their own means or through Arm SystemReady Certification List (SCL) portal. In addition, vendors must provide instructions on how to flash the firmware image binary into the certified board. This will allow users to retrieve the exact version the platform was certified for and deliver the 'it works' promise.

2.3 SystemReady IR certification

2.3.1 SystemReady IR v1.2 requirements, Oct 2022 update

SystemReady IR v1.2 requires the certified devices to be compliant to the following specifications:

- BSA v1.0c for 64-bit devices (only test reporting, no enforcement).
  - There are 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 64-bit device for SystemReady IR v1.2, 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. To certify a 32-bit device for SystemReady IR v1.2, results from running the [SystemReady IR ACS for 32-bit Arm Platforms](#) must be submitted. In addition, installation and boot logs from one Linux or BSD distro are required.

All logs must be submitted using the [IR template](#).

2.3.2 SystemReady IR v2.0 ALPHA requirements, Oct 2022 update

SystemReady IR v2.0 requires the certified devices to be compliant to the following specifications:

- BSA v1.0c for 64-bit devices (only test reporting, no enforcement).
  - There are 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.)
- SystemReady IR v2.0 recommends the certified devices to obtain the [Security Interface Extension certification](#) as secure boot and secure firmware update features are critical to edge and IoT deployment and maintenance. But if that is not possible, the following BBSR rules are still required:
  - R130_BBSR: In-band firmware updates must be implemented in accordance with the requirements in BBR:
    - Firmware must implement UEFI update capsules (UEFI specification section 8.5.3)
    - Firmware must implement the Firmware Management Protocol Data Capsule Structure format (UEFI specification section 23.3)
    - Firmware must implement an ESRT that describes firmware updated in-band (UEFI specification section 23.4)
  - R140_BBSR: Capsule payloads for updating system firmware must be digitally signed
  - R150_BBSR: Before updates to system firmware are applied, images must be verified using digital signatures

- Devicetree v0.3.

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

To certify a 64-bit device for SystemReady IR v2.0, results from running the SystemReady IR ACS v2.0.0 BET-1 must be submitted. In addition, installation and boot logs from two of the Linux distros or BSD are required. The recommended distros are Fedora, Debian, Ubuntu, and openSUSE.

To certify a 32-bit device for SystemReady IR v2.0, results from running the SystemReady IR ACS for 32-bit Arm Platforms must be submitted. In addition, installation and boot logs from one Linux or BSD distro are required. All logs must be submitted using the IR template.

NOTE: Both SystemReady IR v1.2 and v2.0 are available for certification.

For those certified platforms shipped with a different firmware image than the one used for the certification, vendors must make the certified firmware image (binary) available to users, either through their own means or through Arm SystemReady Certification List (SCL) portal. In addition, vendors must provide instructions on how to flash the firmware image binary into the certified board. This will allow users to retrieve the exact version the platform was certified for and deliver the 'it works' promise. This is applicable for both SystemReady IR v1.2 and v2.0.

2.3.3 Future SystemReady IR requirements

In the future, requirements based on newer versions of the BSA/BBR specifications might be added. Security Interface Extension is planned to be required. Waiver levels 0-1 might be deprecated.

2.4 SystemReady LS certification

2.4.1 SystemReady LS v1.0 ALPHA requirements, Oct 2022 update

SystemReady LS v1.0 ALPHA requires the certified devices to be compliant to the following specifications:

- BSA v1.0c and Level 3-6 as defined in SBSA Supplement v6.1.
- LBBR-v1 recipe in BBR v2.0.

To certify a device for SystemReady LS v1.0 ALPHA, results from running the SystemReady LS testing (see instructions) must be submitted. In addition, boot logs from two of the Linux distros are required. The recommended distros are CentOS, Debian, Ubuntu, openSUSE, and Fedora.

All logs must be submitted using the LS template.

2.5 SystemReady Virtual Environment (VE) certification

The Arm SystemReady Virtual Environment (VE) is designed for the certification of virtual environments that can demonstrate the same software "just works" user experience as other SystemReady certifications.

2.5.1 SystemReady Virtual Environment (VE) v1.0 requirements, Oct 2022 update

The requirements for the SystemReady VE certification are the same as specified in Section 2 for other SystemReady bands, with the exceptions specified in this section. A virtual environment may be certified with SystemReady VE to correspond to an equivalent SR, LS, ES and IR band, depending on the virtualized hardware and firmware environment.

The following are exceptions for SystemReady VE certifications:

- The virtual environment may not present sufficient UEFI preboot environment to run the full ACS test suite, including BSA and SBSA compliance tests. As a result, it may not be possible to determine which corresponding SystemReady band to use for the certification. In this case, the virtual environment may be certified without any corresponding SystemReady band. The following testing is still required:

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- o [FirmwareTestSuite](#) (FWTS) must still be used.
  - o Installation and boot logs from the supported OSes.
- Some virtual environments may not allow nested virtualization. Hypervisors such as VMware ESXi may not run. In such cases, the installation and boot logs from one more OS, if possible, may be used instead.

Note: The physical system on which the virtual environment is running does not need to be either SystemReady certified at all or SystemReady certified using the same band as the virtual environment. For example, it is entirely valid to have a virtual environment that is SystemReady VE certified (with corresponding SystemReady ES band) running on a physical system that is not SystemReady certified.

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, as well as Trusted Platform Module (TPM) Support. The requirements are specified in the Base Boot Security Requirements (BBSR) specification.

3.1.1   SystemReady Security Interface Extension v1.1 requirements, Oct 2022 update

The Arm SystemReady Security Interface Extension requires the certified devices to be compliant to the BBSR Specification v1.1.

SystemReady IR v2.0 recommends the certified devices to obtain the [Security Interface Extension certification.](#)

For SystemReady SR devices to be certified with the Security Interface Extension, TPM must be used and the related requirements in BBSR are required.

To certify a device for SystemReady Security Interface Extension, results from running the [ACS for Security Interface Extension v1.1.0](#) must be submitted.

All logs must be submitted using the [SIE template](#).

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" (OS installation and boot from basic media) 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 future generations. 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
    - Non-release build, for example Fedora Rawhide, OpenSUSE Tumbleweed, Ubuntu Daily Build, and 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. The 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 ESXi-Arm 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 exist, resolved with OS change.	No. Major failures exist, resolved with workarounds.	Mostly yes. Some failures exist.
Firmware BBR compliant?	Mostly yes. Some or no failures exist.	Mostly yes. Some or no failures exist.	Mostly yes. Some or no failures exist.
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.	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?	None, or one.	Yes, two or more work with workaround.	Yes, two or more work, 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.	Public waiver issued to partner.

Table 2: SystemReady ES and IR waiver levels

A.1   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.

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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 issuance and publication.
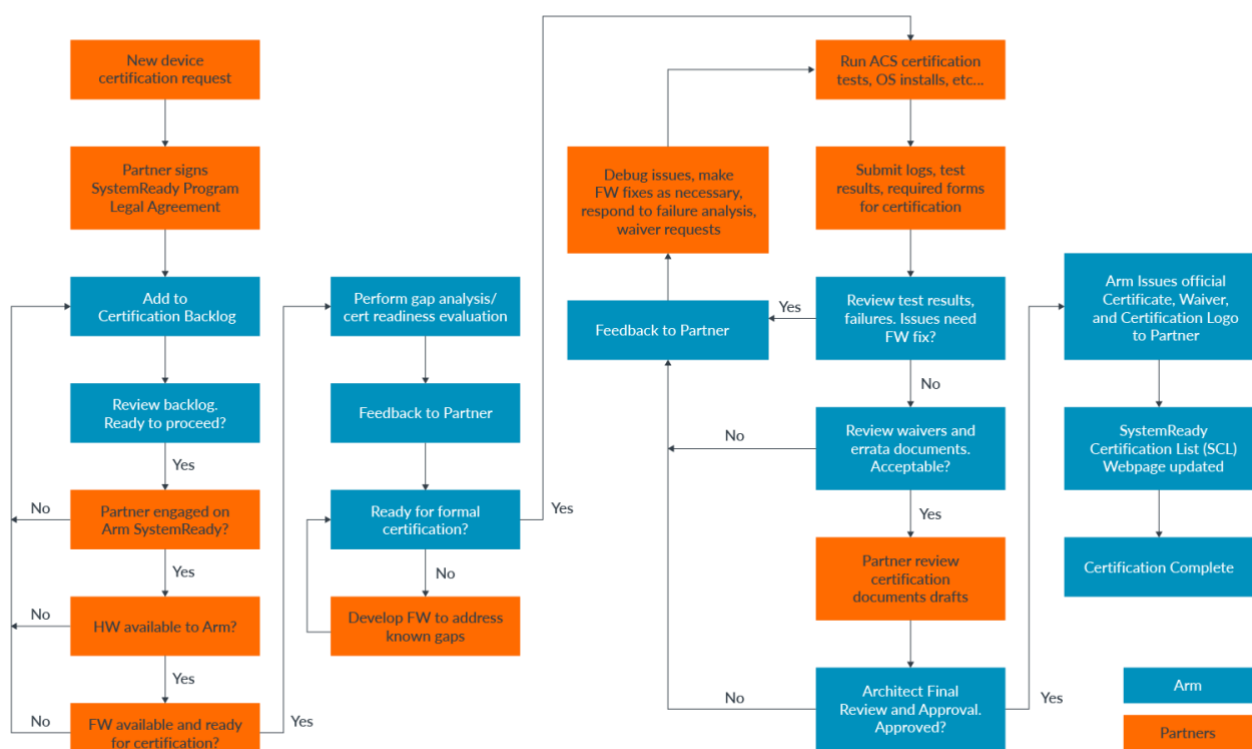
The following flow chart illustrates the Arm SystemReady certification process for updated or derivative systems. This includes certification refresh for existing certified devices with new firmware.

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