Certified
arm ServerReady
Version 1.0

arm

Arm SBMG and Open BMC

- Dong Wei, Standards Architect and Fellow

- April 1, 2019

Why do we need a standards-based approach?

Arm architecture supports a very diverse variety of devices

Diversity is good, but uncontrolled diversity is bad, particularly for servers

- Servers are very different from embedded devices
  - you have to install standard OSs which may even pre-date the SoC (a.k.a., N-1 OS support)
- Installation process needs to ‘just work’
- Modifying the OS to suit the hardware (as it is done in embedded) is not a viable option
- System administrators manage the servers from diverse vendors remotely
- Servers rely on standards to solve this
  - Common rules for hardware and for firmware
  - Commonalities in server management

Copyright © 2019 Arm Limited All rights reserved.

What is the Arm standards-based approach to servers

Arm takes a collaborative standards-based approach to servers

We collaborate with companies across the server ecosystem to create Arm standards for servers

We ensure existing industry standards work well with the Arm architecture

Support open source projects for software and firmware

We also work with OS vendors that are not open source.

Standards Approach

Collaboration

- ArmServerAC 43+ companies
- CSPs, OSVs, ISVs, Silicon vendors, IP vendors, ODMs, OEMs, IBVs, IHVs, …

Create Arm server standards

- SBSA, SBBR, SBMG, PSCI, SMCCC…

Participation in industry standards

- UEFI Forum, PCI SIG, DMTF, OCP, TCG, CCIX Consortium, …

Open source projects and software support

- Trusted Firmware-A
- EDK2
- Linux kernel
- OpenBMC, OpenRMC

Copyright © 2019 Arm Limited All rights reserved.

Arm Server Advisory Committee

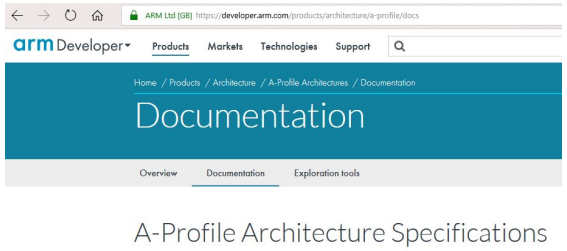
Formed in 2011 to create hardware and firmware ground rules to enable standard OSs to work on Arm-based servers.

Today, it consists of 43+ companies with members from every sector server ecosystem (CSPs, OSVs, ISVs, Silicon vendors, IP vendors, ODMs, OEMs, IBVs, IHVs

Members have an NDA with Arm and can access specifications whilst they are in development – helping us to shape the specs.

The forum has a mailing list and an issue tracker, monthly meetings and yearly events in Asia and the US.

Copyright © 2019 Arm Limited All rights reserved.



A-Profile Architecture Specifications

Arm Arch:

- Armv8.x-A
- SMMU
- GIC
- Extensions:
  - RAS
  - MPAM

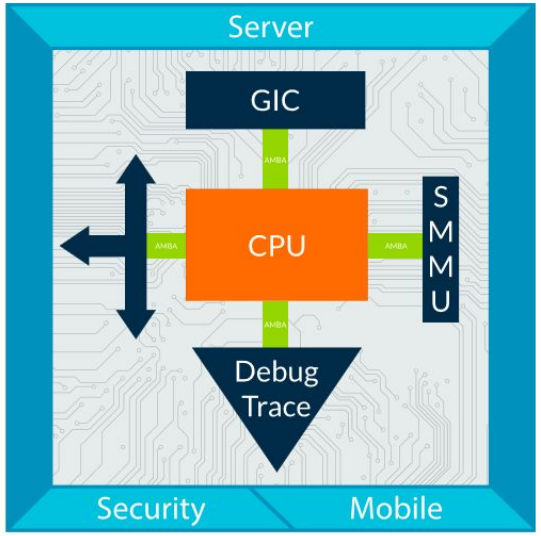
SBSA: Server Base System Architecture

Hardware requirements for Arm-based infrastructure SoCs

Developed in conjunction with the server ecosystem

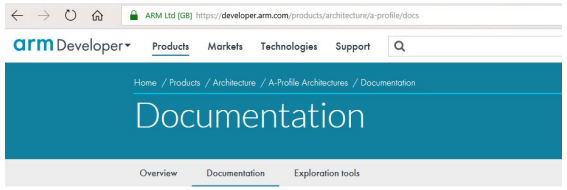
Arm architecture and system architecture and standards

https://developer.arm.com/products/architecture/system-architecture/server-system-architecture



Industry Standards

Copyright © 2019 Arm Limited All rights reserved.



A-Profile Architecture Specifications

Arm Specs

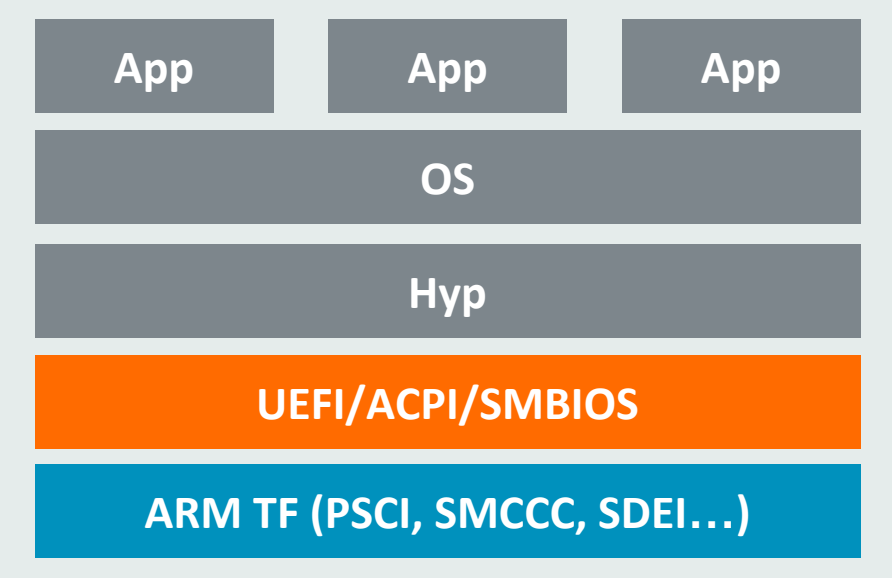
- PSCI
- SMCCC
- Arm TF
- Arm FFH
- Arm MM

SBBR: Server Base Boot Requirements

Firmware requirements for Arm based infrastructure SoCs

Developed in conjunction with the server ecosystem

Requirements for industry standards and Arm firmware specifications
https://developer.arm.com/products/architecture/system-architecture/server-system-architecture



Industry Standards

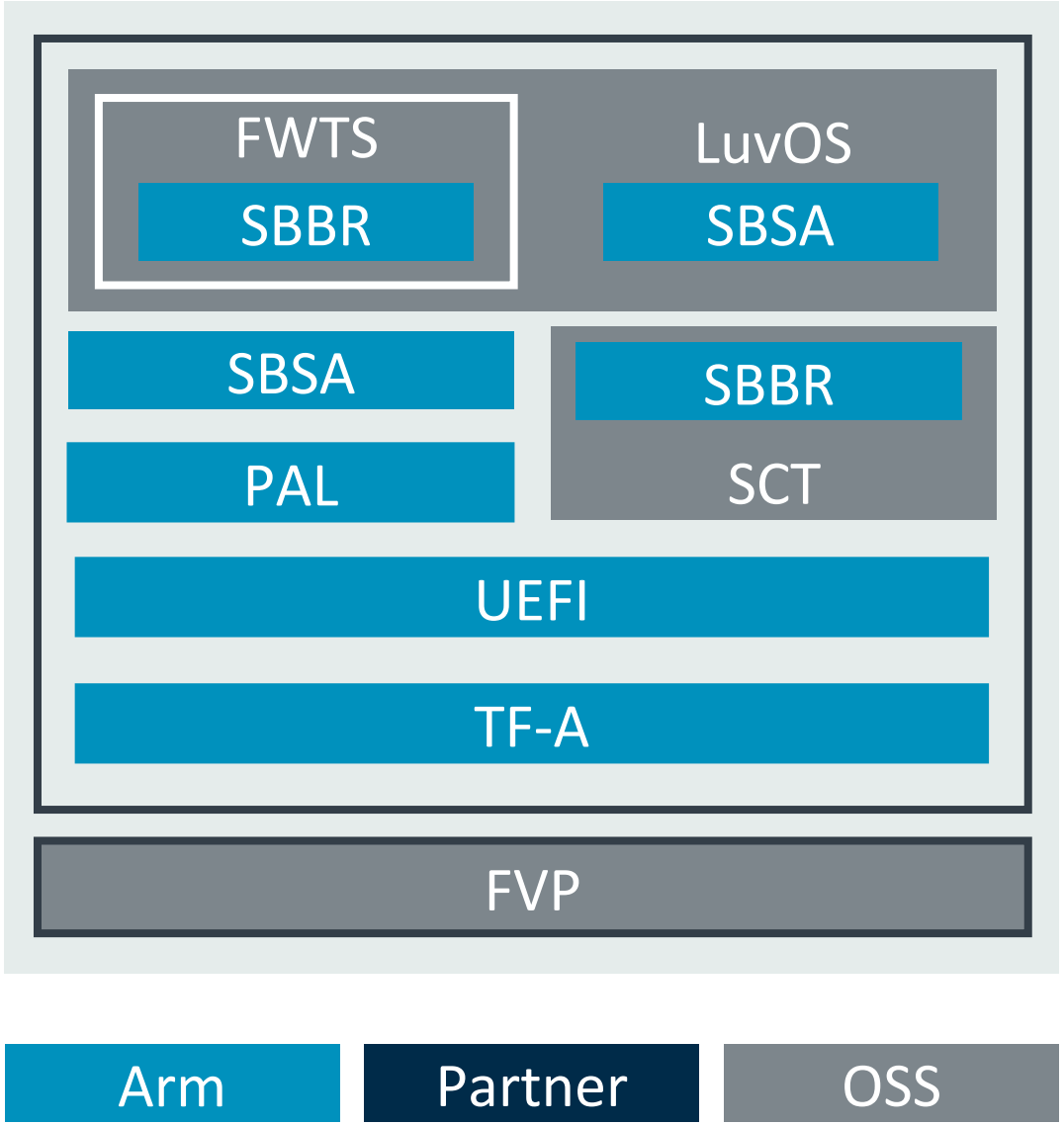
- UEFI
- ACPI

- SMBIOS

- TCG FW spec

- PCI FW spec

Copyright © 2019 Arm Limited All rights reserved.



ACS: Architectural Compliance Suites

SBSA hardware requirements (CPU, GIC, SMMU, PCIe…) properties

- SBSA CPU properties
- SBSA defined system components
- SBSA rules for PCIe integration
  - Based on the PCIe specification
  - Based on standard OS drivers with no quirks enabled

SBBR defined FW requirements (UEFI, ACPI and SMBIOS tests)

- UEFI testing based on the UEFI SCT
- ACPI testing based on FWTS
- SMBIOS testing

The test suites are hosted in GitHub and are open source (Apache v2):

https://github.com/ARM-software/sbsa-acs

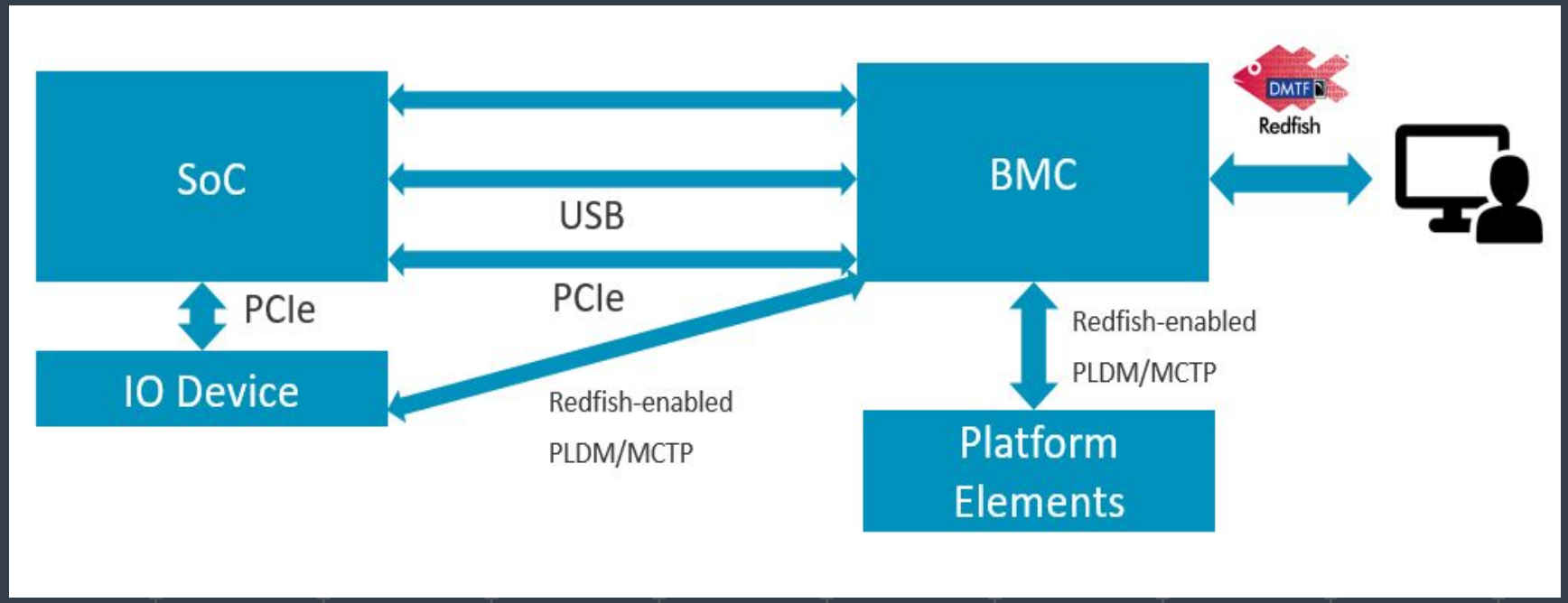
https://github.com/ARM-software/arm-enterprise-acs

Copyright © 2019 Arm Limited All rights reserved.

SBMG: Server Base Manageability Guide

Server system management needs a foundation where common capabilities are standardized and differentiations truly valuable to the end users are built on top. The Server Base Manageability Guide (SBMG) provides a path to the prevalent industry standard system management specifications of Redfish, Platform Level Data Model (PLDM) and Management Component Transport Protocol (MCTP). Vendors still needs to support IPMI in addition in the near future. Together with SBSA and SBBR, the SBMG provides a standard based approach to building Arm servers, their firmware and their server management capabilities. The specification is under development in conjunctions with partners across the industry.

◦



Industry Standards

DMTF

Redfish

- IPMI -

Intelligent Platform Management
Interface Specification
Second Generation

v2.0

How is SBMG developed?

Same as SBSA and SBBR, SBMG is developed within the Arm ServerAC community

We have an engineering request process similar to other standards bodies

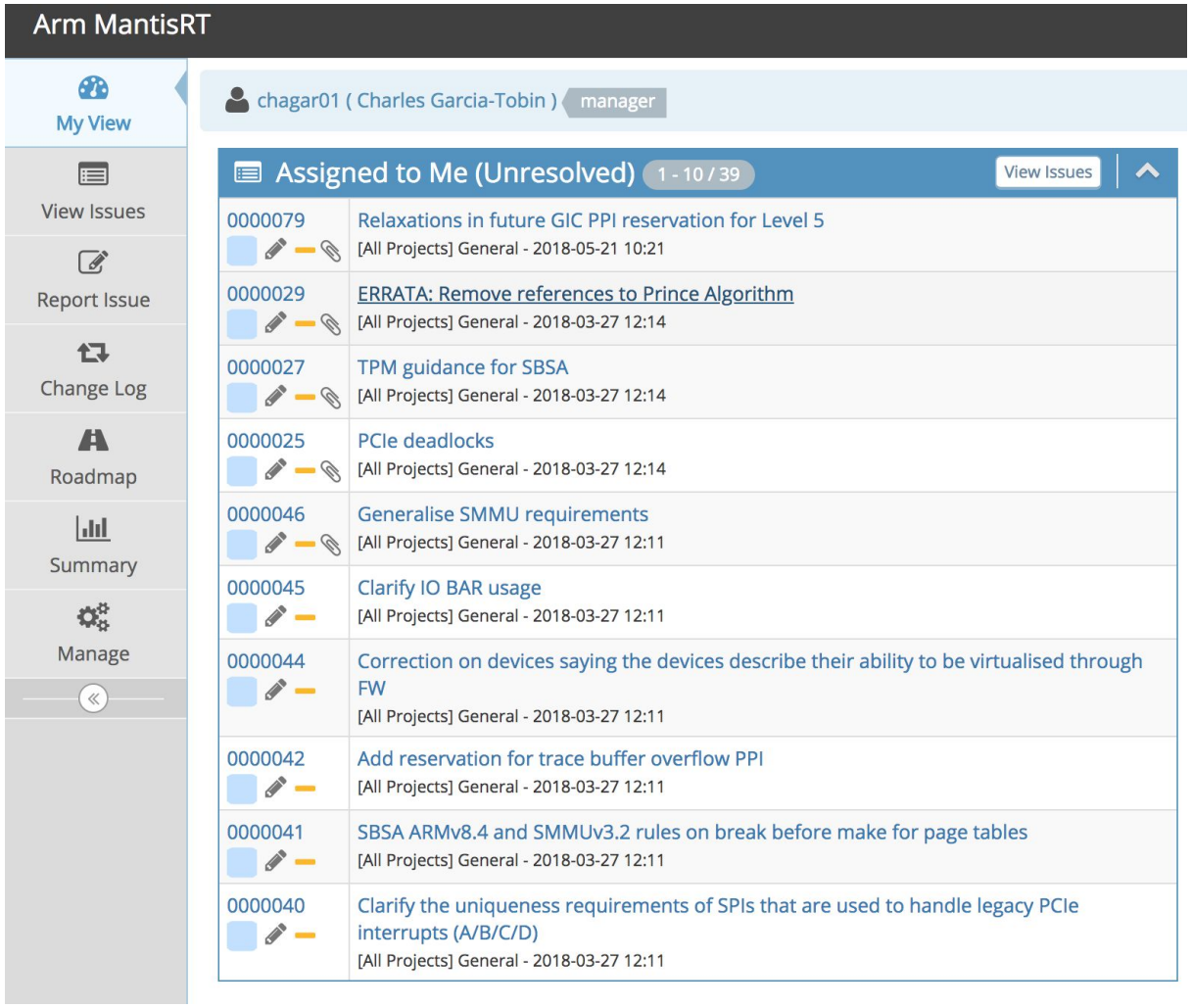
Anybody in the community can raise a request for a change

- Public to community by sending a mail to armserverac-discuss@arm.com
  - Or raising a public ticket on the mantis DB (later)
- Privately to Arm by sending a mail armserverac-request@arm.com
  - Or raising a public ticket on the mantis DB (later)

Copyright © 2019 Arm Limited All rights reserved.

Tracking spec changes

- Mantis based, just another bug tracker, very commonly used by standards bodies
- Projects for SBSA, SBBR, SBMG and “Server ecosystem actions”
- This drives regular monthly meetings
  - Last Friday of the month 7am PST
- To get a log in send a mail to either
  - atg-mantis@arm.com
  - armserverac-request@arm.com

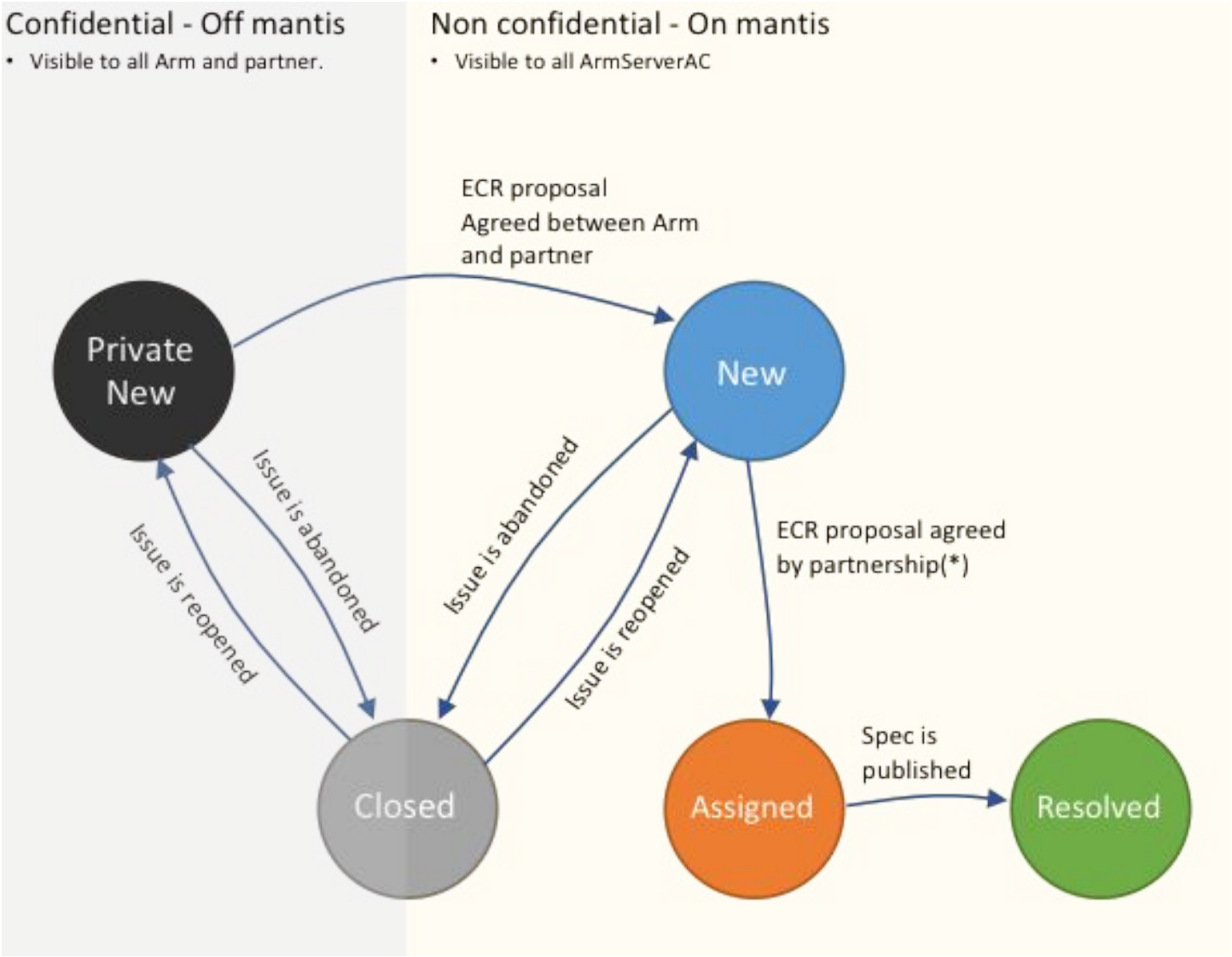


Copyright © 2019 Arm Limited All rights reserved.

Development process

Process:

1. You supply an engineering change request with a justification for change and description of requirement
2. Arm responds to you with a proposal for a spec change
3. When and you and Arm are happy we share with the wider ServerAC
4. When ServerAC approves Arm publishes



Copyright © 2019 Arm Limited All rights reserved.

Why SBMG

Server Management is a critical function for the servers

- Typically includes
  - monitoring sensors in the servers and controlling them
  - Remote firmware update
  - Remote debug
  - Remote server provisioning
  - RAS
- Typically involves a subsystem with a BMC (Baseboard Management Controller)
  - Could also have an RMC (Rack Management Controller)
- BMC and RMC are typically based on Arm core (e.g., A9)
  - Therefore, “Arm Inside” is about 100% true on servers ☺

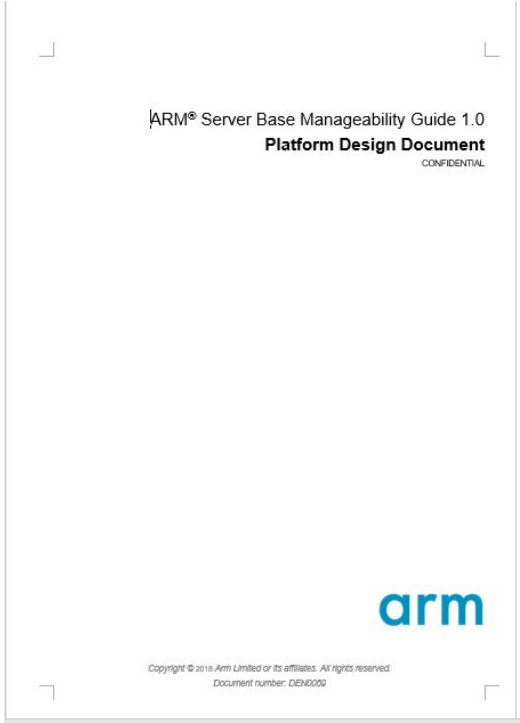
Help guide the Arm server designers to provide common manageability functions to the users

Copyright © 2019 Arm Limited All rights reserved.

So what's in the SBMG?

SBMG provides guidance for the server manageability interfaces

- SoC-BMC Interfaces (e.g., PCIe, USB, additional medium)
- Host Interface (Redfish Host Interface)
- BMC Management Services Interface (Redfish)
- BMC-Platform Elements Interface (Redfish-enabled PLDM/MCTP)
- BMC-IO Device Interface (Redfish-enabled PLDM/MCTP)
- IPMI continues to be required with guidance on minimum IPMI commands supported
- Remote Debug, Platform Monitoring and RAS subteams are formed, firmware update in the future


ARM® Server Base Manageability Guide 1.0
Platform Design Document
CONFIDENTIAL

arm

Copyright © 2018 Arm Limited or its affiliates. All rights reserved.
Document number: DEN0069

Copyright © 2019 Arm Limited All rights reserved.

Remote Debug Subteam

Server Remote Debug is the act of gaining visibility of the hardware and software behaviors of an SoC, using a debugger which is not directly connected to the Server SoC

Typically, the debugger is connected to the Server board via a network connection

- A Board Management Controller (BMC) is the endpoint of the network connection

Objectives:

- Define protocols for communicating between the debugger and the BMC
- Define physical interfaces between BMC and SoC
- Define protocols for communicating between the BMC and the SoC
- Define mechanisms for ensuring only suitable debuggers can access the SoC

Copyright © 2019 Arm Limited All rights reserved.

Platform Monitoring Subteam

This sub group will define interfaces and Protocol needed for BMC – SOC communication in the scope of Platform Monitoring and provide SBMG ECRs accordingly

Below is the list of use cases considered currently

- BMC (Master) to SOC (Slave) communication
- SOC(Master) to BMC (Slave) communication
- BMC to Multiple SOC communication
- BMC assisted SOC power actions
- BMC to monitor critical health of SOC
- BMC to monitor SOC boot progress
- BMC watchdog use cases

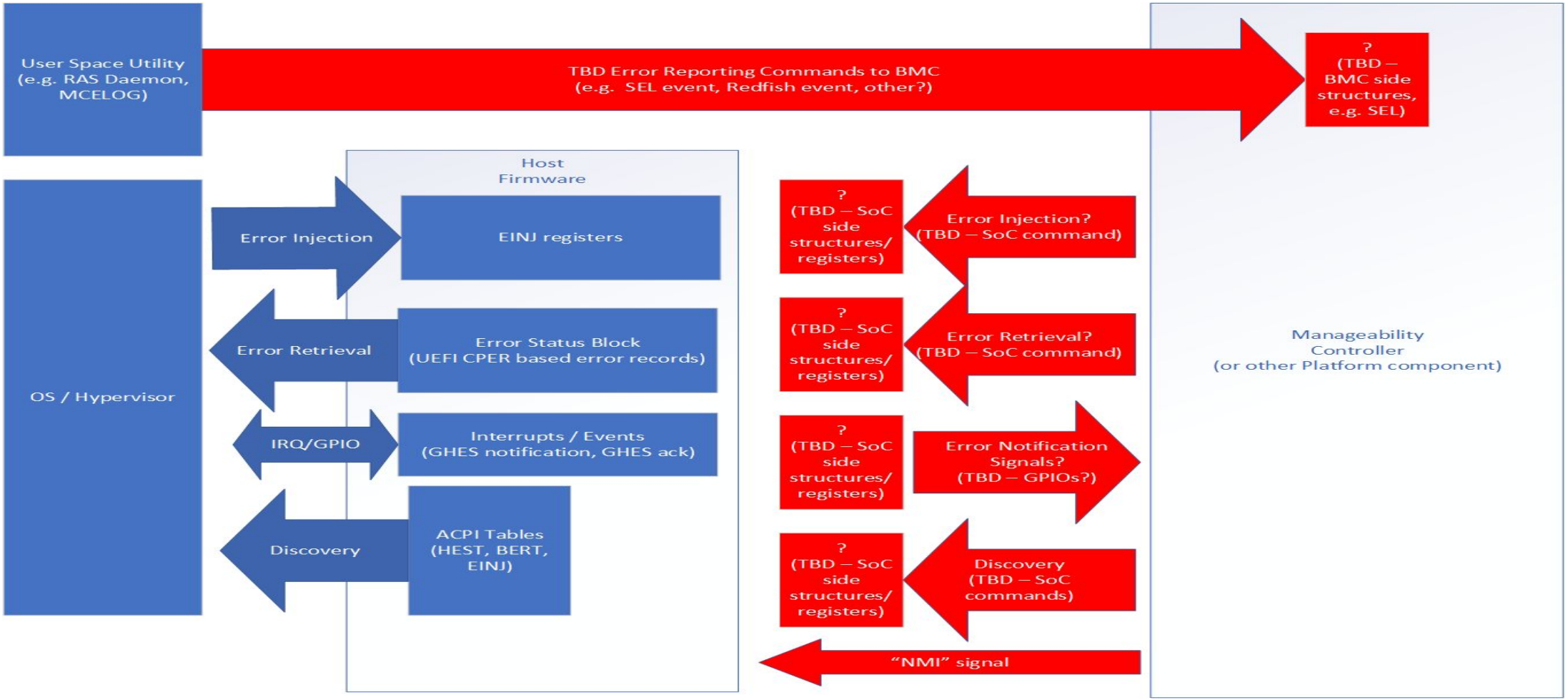
Copyright © 2019 Arm Limited All rights reserved.

RAS Subteam

- Define error record formats.
- Define the BMC manageability interface requirements.
- Define fault notification signal.
- Define the interface and mechanism for injecting hardware errors.

Copyright © 2019 Arm Limited All rights reserved.

RAS Subteam (Cont)



Copyright © 2019 Arm Limited All rights reserved.

IPMI vs Redfish

Cloud vendors are still replying on IPMI to some degrees today

- Redfish starts to appear in northbound API for RMC or OOB for BMC
- BIOS/BMC communications, error reporting, KVM, SOL, etc.

The transition to Redfish-only will take time

- Until servers supporting Redfish are widely available with the needed feature support

Copyright © 2019 Arm Limited All rights reserved.

OpenBMC

Define a standard BMC firmware stack

- https://www.openbmc.org/

Bi-Annual Releases (Feb, Aug)

OpenBMC 2.6

- Yocto 2.6, Linux 4.19
- https://github.com/openbmc/docs/blob/master/release/release-notes.md
- WebUI, SOL, IPMI 2.0, Partial Redfish, etc.

OpenBMC 2.7

- PMCI (MCTP, PLDM)
- Redfish (Firmware Update, Power & Thermal, Virtual Media, etc.)

Copyright © 2019 Arm Limited All rights reserved.

OpenRMC

https://www.opencompute.org/wiki/Hardware_Management/Open_RMC

Rack Management Controller

Northbound API

Southbound API

Copyright © 2019 Arm Limited All rights reserved.

RunBMC

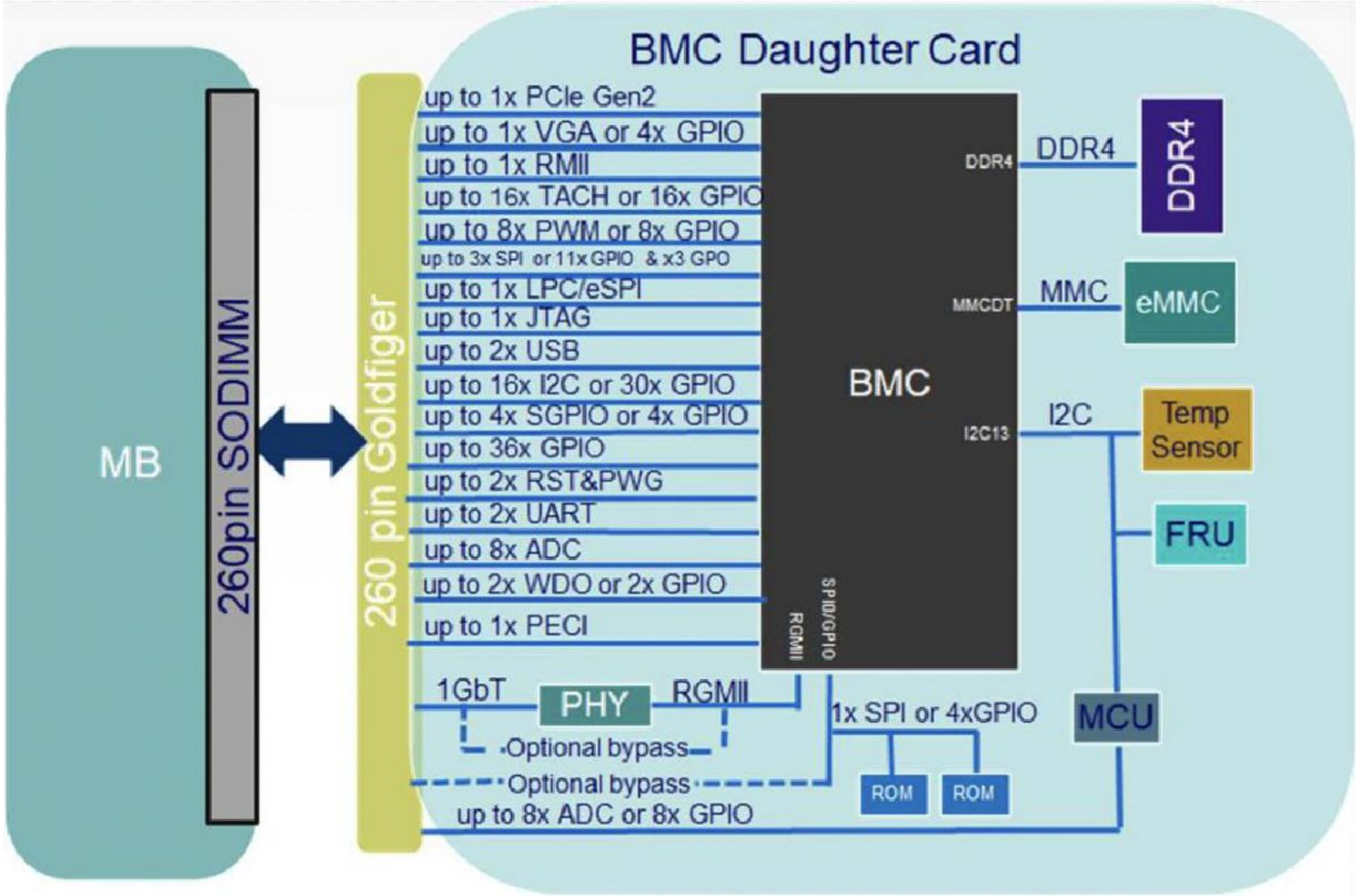
RunBMC Specification

- http://files.opencompute.org/oc/public.php?service=files&t=69e35595c77b84d04b54b3b00b951db5&download

Overview	
Overview	RunBMC specification defines the interface between the Baseboard Management Controller(BMC) subsystem and OCP hardware platforms
Connector and Form Factor	
Connector/FF	260pin DDR4 SO-DIMM Connector. MO-310C JEDEC registration in two different heights. Standard (32mm) and Large (50mm) allowed. Right Angle and Vertical Supported
I/O Connectivity	
I/O	1x PCIe Gen2, 1x VGA, 1xRMII, 16x TACH, 8x PWM, 3x SPI, 1x LPC/ESPI, 1x JTAG, 2x USB, 16x I2C, 4x SGPIO, 36x GPIO, 2x RST/PWRGD, 2x UART, 8x ADC, 2x WDO, 1x PECI, 1GbT/RGMII, 8x ADC
Flexible Functionality	
Flexible	Dual Functions for majority of the I/O is supported via multiplexing. Provides system flexibility

Copyright © 2019 Arm Limited All rights reserved.

Daughterboard I/O Connectivity



Copyright © 2019 Arm Limited All rights reserved.

RunBMC Benefits

Improved Security

- Hardened modular BMC as RoT
- Stable design, slower cadence cycle
- Physically easier to control fab

Supply Chain

Manageability

- Consistent interfaces drive consistent code
- Managing platform code

TTM

- No need to redesign BMC

Copyright © 2019 Arm Limited All rights reserved.

Call to Action

Participate in ServerAC to help define SBMG

Participate in OpenBMC to enable reference implementation and open source delivery option

Participate in OCP to influence OpenRMC and RunBMC

Copyright © 2019 Arm Limited All rights reserved.

Certified
arm ServerReady
Version 1.0