BMC Function Specification

Revision: 0.1

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Revision Table

Revision	Description	Date	Author
0.01	Initial Draft	2020/02/13	Katniss, Wang

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1. Introduction

This document presents the BMC functionality of server platform, including FW architecture, configurations, supported IPMI/OEM commands, system interfaces, and sensors of this server platform.

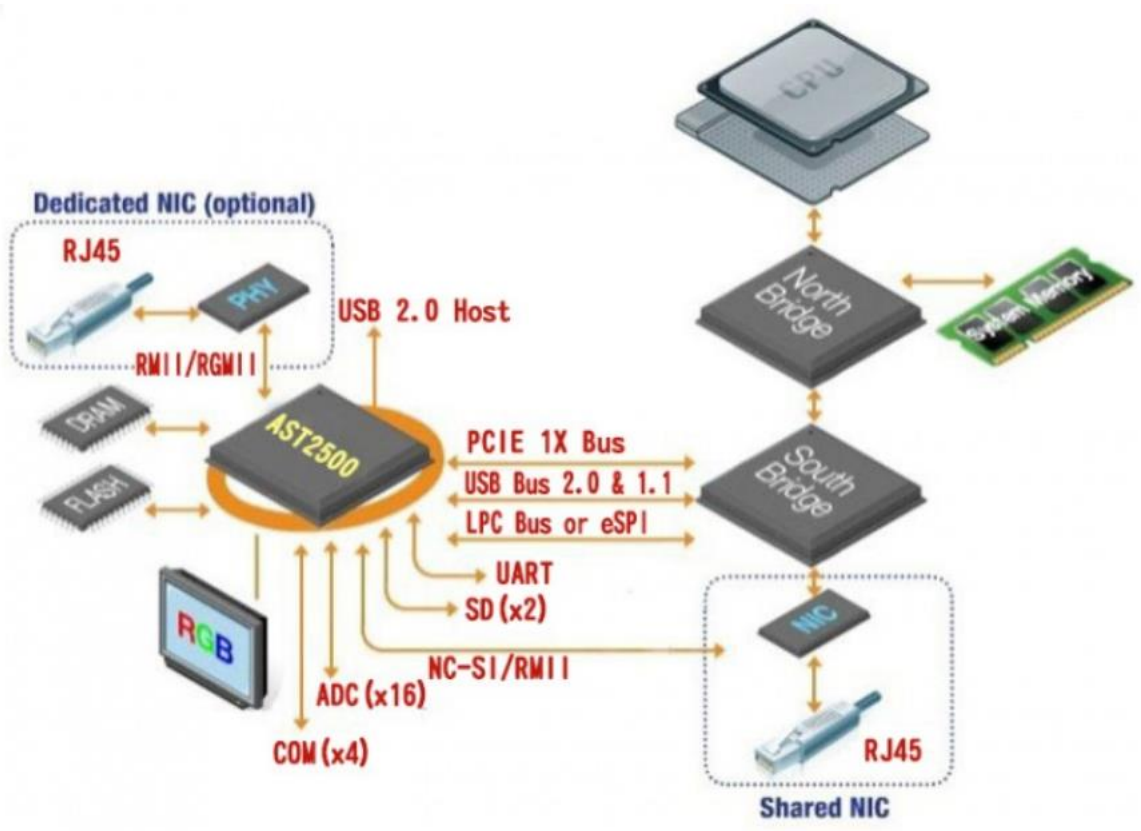
1.1. Reference Documents

Document Name	Version	Description
IPMI 2.0	1.1	IPMI v2.0 rev1.1 October 1, 2013
Platform Management FRU Information Storage Definition v1.0	1.1	FRU v1.0 rev1.1 September 27, 1999

2. Overview of BMC

2.1. ASPEED 2500 Application

Aspeed AST2500 is used as BMC (Baseboard Management Controller) in this platform. It is an ARM base SOC which integrates peripherals including: MAC, USB controller, LPC controller, ADC, SPI controller, I2C controller, PWM and etc. It's an individual controller for server platform and works independently. Figure below shows the application scenario of this chip. BMC monitors system status, and react proper action while detecting failure. Also, users could connect with BMC through both internal (LPC) and remote interface (LAN) to get system information and control system behavior.



2.2. BMC Flash Storage Component

Item	Size	Content	Description
Flash Rom	32MB	BMC firmware, SDR, SEL, and other related parameters.	SPI Serial Flash
SDRAM	512MB	Program variables	EXTERNAL MEMORY – DDR4 SDRAM

2.3. Function list

- Fully compliant with IPMI 2.0 (except Serial/Modem interface)
  - Standard IPMI command
  - LAN interface (with RMCP and RMCP+)
  - System interface (KCS only)
  - Platform Event Filtering
  - Platform Event Trap
  - System Event Log and Event Messages
  - Sensor Data Records and Capabilities
  - Field Replaceable Unit inventory
  - Serial Over LAN
- System health monitoring
- System fan control (co-work with RBP)
- Web service
  - System status and health checking
  - System configuration
  - SEL viewer
  - Remote FW update
  - iKVM
- Redfish 1.1

3. LED Behavior

BMC heartbeat LED, UID LED, fan fail LED and system fault LED which on board/front panel are controlled by BMC. Behavior is described as below.

Name	Color	State	Description
BMC Heartbeat LED	Green	Solid Off	AC power off
		Solid On	AC power on
		Blinking	BMC ready
UID LED	Blue	Solid Off	1. Chassis Identify command “Turn off Identify” 2. Press UID Button while UID light on.
		Solid On	1. Chassis Identify command “Force Identify On”. 2. Press UID Button while UID light off.
		Blinking	Chassis Identify Command except force on/off
System fault LED	Amber	Solid Off	One of the sensors below asserted CPU_PROCHOT CPU_THERMTRIP CPU_CATERR PCH Temp CPU_FAN1 REAR_FAN1 FRNT_FAN1 FRNT_FAN2 FRNT_FAN3 FRNT_FAN4 DRAM ECC ErrorXX – Uncorrectable ECC Error
		Solid On	All the sensors below de-asserted CPU_PROCHOT CPU_THERMTRIP CPU_CATERR PCH Temp CPU_FAN1 REAR_FAN1 FRNT_FAN1 FRNT_FAN2 FRNT_FAN3 FRNT_FAN4

			DRAM ECC ErrorXX – Uncorrectable ECC Error
FAN_LED	Amber	Solid Off	Fan health OK
		Blinking	Fan health fail

4. The PEF and Alerting Design

The PEF and Alerting mechanism is implemented in BMC. In order to make it active, the user must configure the Event Filter Table and Alert Policy Table correctly. For detailed configuration methods, please refer to IPMI v2.0 Specification. The supported PEF actions are listed below:

- Power down
- Power cycle
- Reset
- Send alert (PET)

5. Serial Over LAN Function

Serial over LAN provides a mechanism that enables the serial controller of a managed system to be redirected over an IPMI session over IP. This enables remote console applications to provide access to text-based interfaces for BIOS, utilities, operating systems, and applications while simultaneously providing access to IPMI platform management functions. SOL is implemented as a payload type under the new payload capability in RMCP+. This can be used to enable asynchronous serial-based OS and pre-OS communication over a connection to the BMC. SOL is implemented as a payload type under the IPMI v2.0 “RMCP+” protocol. Following is SOL default configurations:

Item	Description
Channel#	01h (LAN channel)
Bit Rate	115200
Flow control	None
Payload port	26Fh

6. IPMI Configuration

6.1. User Accounts

10 user accounts are supported to login BMC through LAN connection. Default users are list in below table.

Default User Name	Password	Privilege
admin	admin	ADMINISTRATOR

6.2. Power Restore Policy

Default power restore policy is "**Previous State**". Power restore policy can be modified by standard IPMI command "Set Power Restore Policy Command".

Power Restore Policy	Description
Always Power On	Always power up after AC/mains is applied or returns.
Always Power Off	Always stays powered off after AC/mains is applied or returns.
Previous State	After AC/mains is applied or returns, power is restored to the state that was in effect when AC/mains was removed or lost

7.FRU Information

The FRU format will follow Platform Management FRU Information Storage Definition spec.
Below items will be programed during base board manufacturing process. A software tool also available for user to program or change FRU items during assembling process.

7.1. Chassis Info Area

Field Length	Field	Default Data
1	Chassis Info Area Format Version	01h
1	Chassis Info Area Length	
1	Chassis Type (enumeration)	
1	Chassis Part Number type/length	
N	Chassis Part Number bytes	
1	Chassis Serial Number type/length	
M	Chassis Serial Number bytes	
xx	Custom Chassis Info fields, if any. Each fields must be preceded with type/length byte.	
1	C1h (type/length byte encoded to indicate no more info fields).	
Y	00h - any remaining unused space	
1	Chassis Info Checksum (zero checksum)	zero checksum

7.2. Board Info Area

Field Length	Field	Default Data
1	Board Area Format Version	01h
1	Board Area Length (in multiples of 8 bytes)	
1	Language Code	00h
3	Mfg. Date / Time	
1	Board Manufacturer type/length byte	
P	Board Manufacturer bytes	‘ASRockRack’
1	Board Product Name type/length byte	
Q	Board Product Name bytes	
1	Board Serial Number type/length byte	
N	Board Serial Number bytes	
1	Board Part Number type/length byte	zero checksum

M	Board Part Number bytes	
1	FRU File ID type/length byte	
R	FRU File ID bytes	
xx	Additional custom Mfg. Info fields.	
1	C1h (type/length byte encoded to indicate no more info fields).	
Y	00h - any remaining unused space	
1	Board Area Checksum (zero checksum)	zero checksum

7.3. Product Info Area Format

Field Length	Field	Default Data
1	Product Area Format Version	01h
1	Product Area Length (in multiples of 8 bytes)	
1	Language Code	00h
1	Manufacturer Name type/length byte	
N	Manufacturer Name bytes	
1	Product Name type/length byte	
M	Product Name bytes	
1	Product Part/Model Number type/length byte	
O	Product Part/Model Number bytes	
1	Product Version type/length byte	
R	Product Version bytes	
1	Product Serial Number type/length byte	
P	Product Serial Number bytes	
1	Asset Tag type/length byte	
Q	Asset Tag	
1	FRU File ID type/length byte	
R	FRU File ID bytes	
xx	Custom product info area fields, if any (must be preceded with type/length byte)	
1	C1h (type/length byte encoded to indicate no more info fields).	
Y	00h - any remaining unused space	
1	Product Info Area Checksum (zero checksum)	zero checksum

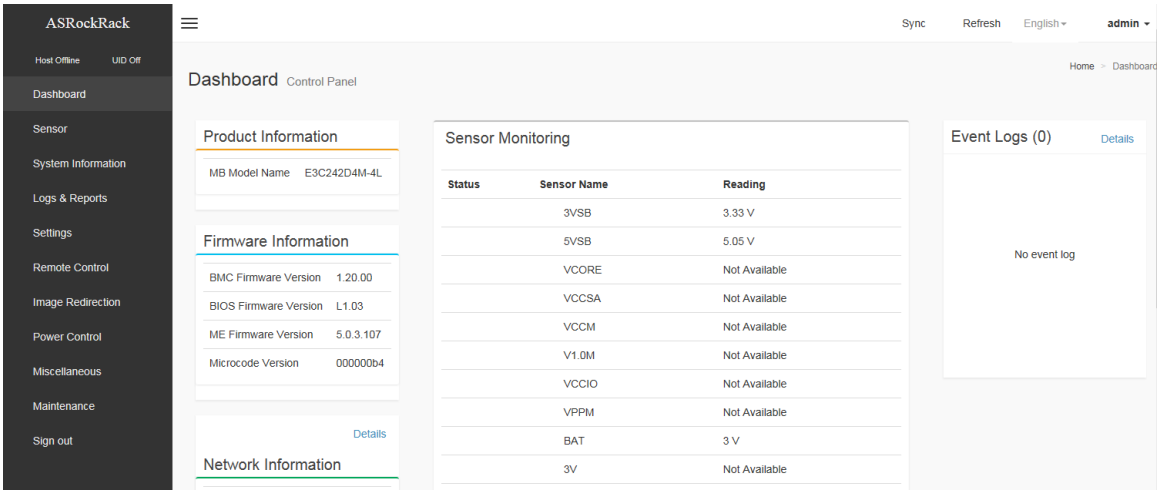
8. Web Support

8.1. Web Display

Image below is BMC web display. Users can check system sensor status, SEL status, set BMC configuration and remote FW update.
Supported browser list:
Chrome 63.0.3239.132
Firefox 57.0.4

Language support list:
English
Traditional Chinese
Simplified Chinese

Note: While multiple sessions are created, Chrome will try to open multiple sockets to re-connect with server if server is busy. We will suggest to avoid using Chrome to open multiple sessions (above 6 sessions) on web service.



9. Sensors

9.1. Threshold base sensors

LNR: Lower non-recoverable

LC: Lower critical

LNC: Lower non-critical

UNC: Upper non-critical

UC: Upper critical

UNR: Upper non-recoverable

Sensor#	Sensor Name	Sensor Type	Threshold					
			LNR	LC	LNC	UNC	UC	UNR
01h	3VSB	02h-Voltage	2.82	2.97	N/A	N/A	3.63	3.78
02h	5VSB	02h-Voltage	4.25	4.5	N/A	N/A	5.5	5.75
03h	VCORE	02h-Voltage	N/A	N/A	N/A	N/A	1.89	1.98
04h	VCCSA	02h-Voltage	0.89	0.95	N/A	N/A	1.16	1.21
05h	VCCM	02h-Voltage	1.02	1.08	N/A	N/A	1.32	1.38
06h	V1.0M	02h-Voltage	0.89	0.95	N/A	N/A	1.16	1.21
07h	VCCIO	02h-Voltage	0.81	0.86	N/A	N/A	1.05	1.09
09h	VPPM	02h-Voltage	2.2	2.32	N/A	N/A	2.84	2.96
0Ch	BAT	02h-Voltage	2.55	2.7	N/A	N/A	3.3	3.45
0Dh	3V	02h-Voltage	2.82	2.97	N/A	N/A	3.63	3.78
0Eh	5V	02h-Voltage	4.25	4.5	N/A	N/A	5.5	5.75
0Fh	12V	02h-Voltage	10.2	10.8	N/A	N/A	13.2	13.8
18h	PSU1 VIN	02h-Voltage	N/A	N/A	N/A	N/A	VIN_MAX	N/A
19h	PSU2 VIN	02h-Voltage	N/A	N/A	N/A	N/A	VIN_MAX	N/A
20h	PSU1 IOUT	03h-Current	N/A	N/A	N/A	N/A	IOUT_MAX	N/A
21h	PSU2 IOUT	03h-Current	N/A	N/A	N/A	N/A	IOUT_MAX	N/A
30h	MB Temp	01h-Temperature	N/A	N/A	N/A	54	55	N/A
31h	Card Side Temp	01h-Temperature	N/A	N/A	N/A	69	70	N/A
32h	TR1 Temp	01h-Temperature	N/A	N/A	N/A	65	N/A	N/A
33h	CPU Temp	01h-Temperature	N/A	N/A	N/A	91	N/A	N/A
35h	PCH Temp	01h-Temperature	N/A	N/A	N/A	107	108	N/A
60h	CPU_FAN1	04h-Fan	N/A	N/A	100	N/A	N/A	N/A
62h	FRNT_FAN1	04h-Fan	N/A	N/A	100	N/A	N/A	N/A
63h	FRNT_FAN2	04h-Fan	N/A	N/A	100	N/A	N/A	N/A
66h	REAR_FAN1	04h-Fan	N/A	N/A	100	N/A	N/A	N/A

Sensor#	Sensor Name	Sensor Type	Threshold					
			LNR	LC	LNC	UNC	UC	UNR
64h	FRNT_FAN3	04h-Fan	N/A	N/A	N/A	N/A	N/A	N/A
67h	FRNT_FAN4	04h-Fan	N/A	N/A	100	N/A	N/A	N/A
70h	PSU1 PIN	08h-Powe Supply	N/A	N/A	N/A	N/A	PIN_MAX	N/A
71h	PSU2 PIN	08h-Powe Supply	N/A	N/A	N/A	65	PIN_MAX	N/A
74h	PSU1 POUT	08h-Powe Supply	N/A	N/A	N/A	N/A	POUT_MAX	N/A
75h	PSU2 POUT	08h-Powe Supply	N/A	N/A	N/A	N/A	POUT_MAX	N/A

9.2. Discrete sensors

Sensor#	Sensor Name	Sensor Type	Event Reading Type	Sensor Specific offset
90h	ChassisIntr	05-Physical Security	6Fh-Sensor specific	00h – General Chassis Intrusion
91h	CPU_PROCHOT	07h-Processor	03h-‘digital’ Discrete	
93h	CPU_THERMTRIP	07h-Processor	6Fh-Sensor specific	01h – Thermal Trip
95h	PSU1 Status	08h-Powe Supply	6Fh-Sensor specific	00h – Presence detected
96h	PSU2 Status	08h-Powe Supply	6Fh-Sensor specific	00h – Presence detected
99h	CPU_CATERR	07h-Processor	03h-‘digital’ Discrete	00h – IERR
A1h	PSU1 AC lost	08h-Powe Supply	6Fh-Sensor specific	03h – Power Supply input list (AC/DC)
A9h	PSU2 AC lost	08h-Powe Supply	6Fh-Sensor specific	03h – Power Supply input list (AC/DC)

10. Firmware Update

10.1. Flash utility – Yafuflash

Utility: Yafuflash
Usage: Yafuflash **[OPTION] [FW_IMAGE_FILE]**
Perform BMC Flash Update

-?	Displays the utility usage
-h	Displays the utility usage
-V	Displays the version of the tool
-e	List outs a few examples of the tool

OPTION :

-info	Displays information about current FW and new FW.
-msi,-img-section-info	Displays information about current FW Sections.
-mi,-img-info	Displays information about current FW Versions.
-fb,-force-boot	Option to FORCE BootLoader upgrade during full upgrade. Also, skips user interaction in Interactive Upgrade mode. This option is not allowed with interactive upgrade option
-bu,-block-upgrade	Option to Flash using Block by Block method
-netfn 0xXX	Option to Flash using OEM specific Netfuncion
-pc,-preserve-config	Option to preserve Config Module during full upgrade. If platform supports Dual Image, this option skips user interaction, preserves config and continues update process. This option is not allowed with interactive upgrade option.
-ipc,-ignore-platform-check	If this image is for a different platform, this option skips user interaction and continues update process.
-idi,-ignore-diff-image	If this image differs from the one currently programmed, this option skips user interaction and continues update process.
-isi,-ignore-same-image	If this image is same as the one currently programmed, this option skips user interaction and continues update process.
-iml,-ignore-module-location	If module(s) of this image is/are in a different location, this option skips user interaction and continues update process.
-ibv,-ignore-boot-version	If bootloader version is different and -force-boot is not specified, this option skips user interaction and continues update process. The bootloader will be updated.
-iri,-ignore-reselect-image	This option skips reselecting the active image.
-inc,-ignore-non-preserve-config	If the Images of both flash share the same Configuration area.

	Not preserving will restore to default factory settings, this option skips it.
-msp,-split-img	Use this option to flash split image.
-f-XXX,-flash-XXX	Use this option to flash spection section where XXX denotes name of the section,
	example -flash-conf. If it is split image need to give -split-img along with this option.
-q,-quiet	Use the option to show the minimum flash progress details.
-i	Option to interactive upgrade (upgrade only required Modules)
-f,-full	Performs full firmware upgrade with Interactive Upgrade mode. Skips option to select individual module upgrade.
	This option must be used along with -i (-interactive) option.
-sc,-skip-crc	Option to skip the CRC check(Only for Dual Image Support)
-sf,-skip-fmh	Option to skip the FMH check(Only for Dual Image Support)
-d	Option to specify the peripheral(Only for Dual Image Support)
	<BIT0> - BMC
	<BIT1> - BIOS
	<BIT2> - CPLD
	<BIT4> - ME
	<BIT6> - PLDM
-mse,-img-select	Option to specify the Image to be updated
	0 - Inactive Image
	1 - Image 1
	2 - Image 2
	3 - Both Images
-a,-activate	Option to activate peripheral devices
	<BIT0> - BMC
	<BIT1> - BIOS
	<BIT2> - CPLD
-ini	Option to give ini file as input.Ini file should be present in the current directory of the Yafuflash executable or in /etc folder
	1. Yafu_SingleImage.ini - For Single Image.
	2. Yafu_DualImage.ini - For Dual Image.
	3. Yafu_MMCImage.ini - For MMC Image.
-spi , -mmc	Option to Flash HPM Image Component wise
	0 -BOTH
	1 -SPI Image
	2- MMC Image
-nr,-no-reboot	Option to skip the reboot.

	With online-flash spport, if conf/extlog is not preserved, BMC will still reboot.
-pXXX,-preserve-XXX	Option to preserve XXX configuration. Where XXX falls in sdr, fru, sel, ipmi, auth, net, ntp, snmp, ssh, kvm, syslog. If the preserve status of another configuration is enabled, then it will ask to confirm that those configuration is to be preserved.
-ieo, -ignore-existing-overrides	Clears the existing overrides and preserves only the overrides given in command line if any
-rp,-replace-publickey	Option to replace the Signed Image Key in Existing Firmware
-vcf,-version-cmp-flash	Option to skip flashing modules only if the versions are same by selecting (N/n). Option (Y/y) Selects full firmware upgrade mode.
-non-interactive	This option skips user interaction. This option cannot be used along with 'ignore-diff-image', 'ignore-same-image', '-ignore-module-location' & '-ignore-boot-version' options.
MEDIUM :	
-cd	Option to use USB Medium
-nw,-ip,-u,-p,-host,-port	Option to use Network Medium '-ip' Option to enter IP, when using Network Medium '-host' Option to enter host name, When using Network Medium '-u' Option to enter UserName, When using Network Medium '-p' Option to enter Password, When using Network Medium '-port' Option to enter Port Number
-kcs	Option to use KCS Medium
-kcsport	Option to use alternate KCS port(Base address of Data Port, Status Port) when using KCS Medium. if not given default KCS port will be used
FW_IMAGE_FILE :	
fw_image_file	Firmware Image file name
-pe,-preserve-extlog	Option to preserve extlog configuration during firmware flash
-sd	Option to update image in SD Card

10.1.1. Update BMC/BIOS for Linux Version

1) Copy Yafuflash and <rom image> under the same folder.
2) Open Linux terminal and change the path to the folder then execute below command :

```
For BMC:
[Linux Prompt]# ./Yafuflash -nw -fb -ip <IP Address> -u <Username> -p <Password>
<BMC_rom_file>
```

```
For BIOS
[Linux Prompt]# ./Yafuflash -nw -ip <IP Address> -u <Username> -p <Password> -d 2
<BIOS_rom_file>
```

3) Type (Y/y) to do Full Firmware Upgrade.
4) After update finished, it will reset automatically.

10.1.2. Update BMC/BIOS for Windows Version

1) Copy Yafuflash.exe, LIBIPMI.dll, and <rom image> under the same folder.
2) Open Windows Command Prompt and change the path to the folder then execute below command :

```
For BMC:
Command Prompt:\> Yafuflash -nw -fb -ip <IP Address> -u <Username> -p <Password>
<BMC_rom_file>
For BIOS:
Command Prompt:\> Yafuflash -nw -ip <IP Address> -u <Username> -p <Password> -d 2
<BIOS_rom_file>
```

3) Type (Y/y) to do Full Firmware Upgrade.
4) After update finished, it will reset automatically.

10.2. Web Flash Interface

10.2.1. Update BMC

1) Login to BMC Web User Interface.
2) Click Maintenance
3) Click Firmware Update
4) Select preserve configuration or not. For general usage, we will suggest to overwrite all items.
5) Wait for image uploading. After uploading complete, click “Flash selected sections”
6) After process complete, restart web and reconnect to BMC.

10.2.2. Update BIOS

1) Login to BMC Web User Interface.
2) Click Maintenance
3) Click BIOS Update
4) Select preserve configuration or not. For general usage, we will suggest to overwrite all items.
5) Wait for image uploading. After uploading complete, click “Flash selected sections”
6) After process complete, restart web and reconnect to BMC.