SV7110

BMC User Manual

Version 1.2

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Revision History

Date	Version	Changes
2015/03/19	1.0	First release
2015/04/24	1.1	Revised sections 1.1, 1.6.2 and 2.2
2015/05/08	1.1	Revised limitation item 2 in section 2.2.3
2015/11/20	1.1	Revised section 2.2.3: Change "./Yafuflash -u USERID -p PASSW0RD -nw -ip 192.168.0.100 -d 2 ~/AMI.iso0" to "./Yafuflash -u USERID -p PASSW0RD -nw -ip 192.168.0.100 -d 2 ~/AMI.iso"
2015/12/28	1.2	1. Updated BMC and BIOS firmware updates in Chapter 4. 2. Added 2.2.4 Expander Firmware Update via in-band SAS Interface in Chapter 4.

Contents

Preface

Wiwynn SV7110 Baseboard has a BMC for various platform management services and interfaces with both storage sub-systems on the baseboard and computing module on the Panther+ card.

Introduction

BMC is a standalone system in parallel to the host (SV7110 baseboard and Panther+ card). The health status of the host system should not affect the normal operation and network connectivity of BMC. BMC does not share memory with the host system. BMC management connectivity should work independently from the host, and has no NIC driver dependency for Out-Of-Band communication while using a shared-NIC.

BMC firmware support IPMI 2.0 compliant features and all features must be remotely accessible. Baseboard Management Controller (BMC) functionality is based on the SV7110 platform which is designed for storage server with platform management system.

Audience

This BMC User Manual is for personnel involve in the design, development, validation, integration, production and support of Wiwynn SV7110 systems. It is intended for PM (Project Manager), TM (Technical Manager), QT (Quality Test), Architect, SI (System Integrator) and related team leaders.

Conventions

CAUTION

Indicates the presence of a hazard that may cause minor personal injury or property damage if the CAUTION is ignored.

WARNING

Indicates the presence of a hazard that may result in serious personal injury if the WARNING is ignored.

`Commands` Commands appear in this `font`.

Safety Information

WARNING

Before you start using your server product, pay close **attention** to all safety instructions.

WARNING

To prevent personal injury or equipment damage from hazardous electrical conditions that may be present on power, telephone and communication cables, turn off the server and disconnect the power cord, telecommunications systems, networks and other connected devices before opening the server.

WARNING

Electrostatic discharge (ESD) can damage disk drives, boards and other parts. It is recommended to perform the procedures in this chapter in an ESD workstation or provide some ESD protection by wearing an anti-static wrist strap to the chassis ground (any unpainted metal surface) on your server when handling parts.

1. Hardware Overview

ASPEED AST1250 is an Integrated Remote Management Processor (IRMP), functioning as Baseboard Management Controller (BMC) in the SV7110 Baseboard. It is a vastly integrated SoC device playing as a service processor to support various functions required for highly manageable server platforms. Highlighted features are as follows:

- Embedded an ARM926EJ 32-bit RISC CPU and a ColdFire V1 CPU
- Internal SRAM and external DDR3 ECC SDRAM
- Fourteen sets of multi-function I2C/SMBus bus controllers
- Five sets of UART I/O interface, four sets with full flow control
- Up to 216 GPIO pins
- Supports eight PWM outputs, with three types of frequency mode PWM for fan speed control
- Up to sixteen fan tachometer inputs (NCT7904D is used to read fan speed in SV7110)
- Adopt full-scan-chain design methodology for testing internal logic by Automatic Test Pattern Generation (ATPG)
- Supports Built-In-Self-Test (BIST) and JTAG-compliant boundary scan 408 pin, 19mmx19mm TFBGA package, 0.8mm ball pitch
- BMC controller with IPMI 2.0/1.5 compliant
- LAN: NCSI or SMBUS sideband through Mezzanine card
- SPI flash memory
- Up to sixteen integrated 10-bit ADCs, low-leakage inputs to measure voltage rails

- Voltage monitor by BMC ADC
- SV7110 baseboard uses ADC controller integrated in BMC for voltage monitor. Voltages are reported as part of the system enclosure status, and monitored.

1.1 BMC-related Baseboard Features

- One BMC is responsible for system enclosure management services, such as fan control and standard IPMI functions.
- Two I2C buses to exchange information between SAS expander and BMC,
- One 10GbE mezzanine card that supports a single 10GbE port (SFP+).
  - Shared NIC feature support on the 10GbE mezzanine card for out-of-band management, by connecting both NCSI/RMII between 10GbE card and BMC.
  - MAC address for SV7110 system should follow these two rules:
    - CX3: each card reserves 3 MAC, port 0, port 1, BMC; BMC uses port 0 + 2
    - Niantic: each card reserves 5 MAC: port 0, port 1, SAN 0, SAN 1, BMC; BMC uses port 0 + 4
- One debug header, to accept existing OCP debug card.
  - POST code from Panther+ card (through FPGA to BMC via I2C bus), is driven by BMC to a 7-segment display.

- The slide switch located beside the debug header on the SV7110 baseboard is used to select POST code or error code to be displayed on the debug card. Manufacturer's default setting is POST code.
- Two switch buttons:
  - Power button: If pressed for less than four seconds, a Power Management Event indicating that the power switch has been triggered will be issued. If pressed for more than four seconds, the SV7110 baseboard and Panther+ card will perform a hard power off.
  - Reset button: If pressed for any duration of time, the SV7110 baseboard and Panther+ card will perform a hard reset and begin executing BIOS initialization code.
- Status LEDs driven by BMC:
  - Power and System ID: blue
  - Fault status: red

1.2 I2C Ports

BMC supports 14 built-in I2C buses to monitor, control, and communicate with other devices. I2C/SMBus Controller implements one set of global registers and 14 sets of device registers to program the various functions supported by AST1250.

1.3 PWM Registers

There are eight built-in PWM registers used by the BMC chip to control the fans. In the SV7110 design, BMC can support up to six PWM fan regions. Each region can have a different speed under firmware control and based on environmental input.

1.4 Fan Speed Reading

AST1250 supports 16 tachometer inputs that are used to measure fan speeds. For SV7110 Dual Rotor fan support, instead of the tachometer in AST1250, BMC will use NCT7904D to monitor each dual rotor fan speed for failover detection, thermal fan curves and acoustic control monitor.

1.5 Remote Power Control and Power Policy

BMC firmware supports remote system power on/off/cycle and warm reboot through in-band or out-of-band IPMI command. The supported power-on options are Last-state, Always-on, and Always-off. Default setting is Last-state.

IPMI command supports change in power policy that takes effect without having to cold reset the BMC firmware or reboot the system.

It takes BMC around 5 seconds from AC power on to process the power button signal and power up system for POST. BMC is ready for BIOS SMM KCS channel communication within 16 seconds.

1.6 Debug Header and UART

The SV7110 baseboard includes a debug header on the front side. It supports hot plugging for an existing debug card. The card has been used in Open Compute servers and Open Vault storage with the following functions:

1.6.1 Debug Header

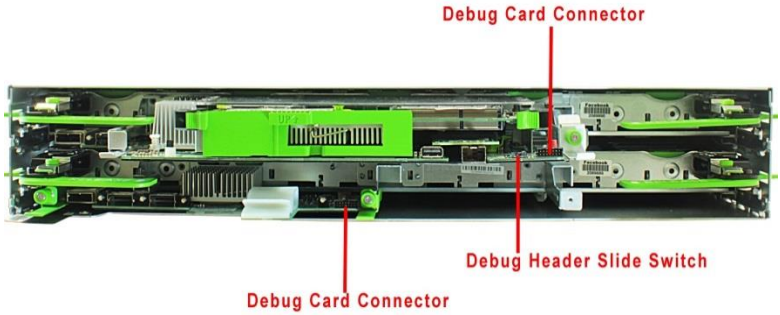
- Two 7-segment LED displays showing the firmware POST information and system error codes.
- One RS-232 serial connector
- One reset button
- One UART channel selection button that sends positive pulse to the SV7110 Baseboard to select and rotate UART console in a loop of: Host console -> BMC debug console -> SAS controller console -> SAS expander console.
- Default baud rate of all channels is 57600 bps.
- Default user name and password are sysadmin and superuser.

1.6.2 Debug Code Selection

The debug card displays a two-digit debug code that can be one of these two:

- POST code from Panther+ card
- Error code from Expander and BMC

Use the slide switch located beside the baseboard debug card connector to select which debug code to be displayed on the SV7110 debug card. Manufacturer's default setting is POST code.



1.6.3 Error Code Definition

Error Code	Description
0	No error
1	Reserved
2	Reserved
3	I2C bus A crash
4	I2C bus B crash
5	I2C bus C crash
6	I2C bus D crash
8	Reserved
9	Reserved
10	Reserved
11	Fan 1 front fault
12	Fan 1 rear fault
13	Fan 2 front fault
14	Fan 2 rear fault
15	Fan 3 front fault
16	Fan 3 rear fault
17	Fan 4 front fault
18	Fan 4 rear fault
19	Fan 5 front fault
20	Fan 5 rear fault
21	Fan 6 front fault
22	Fan 6 rear fault
23	Reserved
24	Reserved
25	PPC CPU temp. critical
26	PPC DIMM A0 temp. critical
27	PPC DIMM A1 temp. critical
28	PPC DIMM B0 temp. critical

Error Code	Description
29	PPC DIMM B1 temp. critical
30	PPC ambient temp. critical
31	DPB temp. 1 critical
32	DPB temp. 2 critical
33	DPB temp. 3 critical
34	DPB temp. 4 critical
35	FCB BJT temp. 1 critical
36	FCB BJT temp. 2 critical
37	HBB SAS ctrl. temp. critical
38	HBB expander temp. critical
39	HBB ambient temp. critical
40	Reserved
41	Reserved
42	Reserved
43	PPC voltage critical
44	HBB voltage critical
45	DPB voltage critical
46	FCB voltage critical
47	PPC current critical
48	HBB current critical
49	FCB current critical
50	HDD0 SMART temp critical
51	HDD1 SMART temp critical
52	HDD2 SMART temp critical
53	HDD3 SMART temp critical
54	HDD4 SMART temp critical
55	HDD5 SMART temp critical
56	HDD6 SMART temp critical
57	HDD7 SMART temp critical
58	HDD8 SMART temp critical

Error Code	Description
59	HDD9 SMART temp critical
60	HDD10 SMART temp critical
61	HDD11 SMART temp critical
62	HDD12 SMART temp critical
63	HDD13 SMART temp critical
64	HDD14 SMART temp critical
65	Reserved
66	Reserved
67	Reserved
68	Reserved
69	Reserved
70	HDD0 fault
71	HDD1 fault
72	HDD2 fault
73	HDD3 fault
74	HDD4 fault
75	HDD5 fault
76	HDD6 fault
77	HDD7 fault
78	HDD8 fault
79	HDD9 fault
80	HDD10 fault
81	HDD11 fault
82	HDD12 fault
83	HDD13 fault
84	HDD14 fault
85	Reserved
86	Reserved
87	Reserved
88	Reserved

Error Code	Description
89	Reserved
90	External Mini-SAS Link Error
91	Internal Mini-SAS Link Error
92	Reserved
93	Self Tray Pulled-out
94	Peer Tray Pulled-out
95	Reserved
96	Reserved
97	Reserved
98	Reserved
99	Firmware and Hardware Mismatch
C2	Correctable Machine Check Error
C3	CPU IERR
C4	Thermal Trip
C5	Bus Correctable Error
C6	Bus Uncorrectable Error
C7	Bus Fatal Error
C8	Memory Hot
CA	Uncorrectable ECC
CD	VR Hot
CE	Processor hot

1.7 uServer Management (Panther+ Card for SV7110)

The FPGA on the Panther+ card works as a management interface with the Intel Atom SoC and provides I2C bus interface to the BMC on the SV7110 baseboard.

This FPGA implements the following peripherals on the local Host/CPU side:

- Two IPMI KCS interfaces (SMM and SMS) as defined in the IPMI specification
- At least one standard 16550 (mapped as COM1/0x3f8 to the host)
- GPIOs for controlling host functions and obtaining status (e.g. processor presence, voltage domain presence, power control, host reset, etc.)
- I2C Proxy interfaces for control and status (e.g. obtaining DIMM and CPU temperatures)
- POST code buffer to hold BIOS/POST progress (mapped as port 80h to the host)

1.8 WatchDog Timer

Watch Dog Timer (WDT) is designed to prevent system deadlock. In general, WDT must be restarted when it reaches timeout.

1.9 LEDs driven by BMC

The SV7110 baseboard has two LEDs on its front, to display various types of information:

- Blue LED for power and system ID

Power/System Identify	Blue LED
Power Off, System ID Off	Consistently Off
Power Off, System ID On	Loop - On for 0.1 second and Off for 0.9 second
Power On, System ID Off	Consistently On
Power On, System ID On	Loop - On for 0.9 second and Off for 0.1 second

- Red LED for enclosure fault status

Enclosure Fault Status	Red LED
Normal system operation	Off
Any fault in whole enclosure	Blinking

1.10 Port 80 POST

BMC supports Port 80 POST code display to drive 8-bit HEX GPIO to debug header. The BMC POST function is ready within 5 seconds after the first AC power on. POST code should also be sent to SoL as well. (Note: This feature is supported by BIOS)

BMC has access to POST code and can record up to 20 POST codes. You can use the OOB raw command to retrieve the last 20 POST codes from BMC.

2. BMC Firmware Functions

2.1 BMC Features Overview

- Support shared-NIC through NCSI or SMBUS sideband
- Support Local serial console and SOL.
- Support for I2C interfaces
- WatchDog support
- SMBus 2.0 support
- IPMI 2.0 compliance
- Read Log events
- Sensor monitoring
- FAN speed control
- IPMI based user management
- Multiple user permission level
- Support for remotely power-cycle, power-down, power-up, reset the server
- Flash Utility-YAFU Flash: IPMI based firmware update
- IPMI command through KCS
- System reset
- BIOS Port 80 post code to seven-segment LED display
- Power and System Identification LED
- Sensors [Analog sensors, Discrete sensors, Event only sensors]
- Firmware update for BMC and FPGA

2.2 Firmware Update

2.2.1 BMC Firmware Update

BMC can implement remote BMC firmware update without requiring any physical input on the system. Remote update can be through Out-Of-Band by management network or through logging into local OS (CentOS) by data network. The BMC firmware update tool(s) support CentOS 5.2.

The following steps show the alternate BMC firmware update by USB:

1 Add this ipmitool command to enable virtual device (default is disable):

```
ipmitool raw 0x32 0xaa 0x00
```

2 Key in;

```
./Yafuflash –u USERID –p PASSW0RD –nw –ip
xxx.xxx.xxx.xxx filename.ima
```

NOTE: The IP address is based on the actual user environment.

Wait for the flash process to finish and BMC will restart automatically.

A remote BMC firmware update may take a maximum of 5 minutes to complete. BMC firmware update and BMC reset processes do not require rebooting or powering down of the host system and have no impact on normal operation of host system. Wiwynn BMC is fully functional after firmware update and reset without requiring further configuration.

BMC supports dual images for fail-over function.

Normally, BCM always boots from image 1. If image 1 is damaged, u-boot selects image 2 to boot. After the user updates image 1, u-boot selects image 1 to boot again.

2.2.2 FPGA Code Update

BMC can implement remote FPGA code update without requiring any physical input on the system. Remote update can be through Out-Of-Band by management network or through logging into local OS (CentOS) by data network. The BMC firmware update tool(s) support CentOS 5.2.

The following steps show the alternate FPGA code update by USB:

1 Add this ipmitool command to enable virtual device (default is disable):

```
ipmitool raw 0x32 0xaa 0x00
```

2 Key in:

`./Yafuflash -cd -cpld fpga.bin` (at local OS)

Wait for the flash process to finish and BMC will restart automatically.

2.2.3 Remote BIOS Recovery via OOB

BMC implements BIOS recovery mechanism through OOB. You can use this command to perform BIOS recovery:

BMC implements BIOS recovery mechanism through OOB. You can use this command to perform BIOS recovery:

Key in:

```
./Yafuflash-u USERID -p PASSW0RD -nw -ip xxx.xxx.xxx.xxx
-d 2 ~/filename.iso
```

NOTE: The IP address is based on the actual user environment

After issuing this command, BIOS recovery mechanism starts automatically.

The limitations are as follows:

1 BIOS boot section should be alive.

2 The image should be in ISO format. The ISO image includes also a CRC-32 checksum and BMC will check if the image is correct or not based it on.

2.2.4 Expander Firmware Update via In-band SAS Interface

NOTE: Wiwynn customers can download XTools from Wiwynn or contact Avago directly for license in using or downloading XTools.

For 12G Expander:

The 12G Expander requires the sas3xfw.fw and mfg.bin binary files to update the firmware via in-band SAS interface on the system. You need to login to the local OS (CentOS) through the data network. The 12G Expander firmware update script uses Avago 12G XTools that support CentOS 6.x.

For example: Expander SAS ID is 570e28402007d0ff

1 Key in this command to update the expander firmware:

```
./g3Xflash -i 570e28402007d0ff -y down fw sas3xfw.fw
```

Wait for the flash process to finish.

2 Key in this command to update the expander configuration region:

```
./g3Xflash -i 570e28402007d0ff -y down mfg mfg.bin 3
```

Wait for the flash process to finish.

3 Key in this command to reset the expander and apply the new expander firmware:

```
./g3Xflash -i 570e28402007d0ff -y reset exp
```

Wait for at least one minute.

For 6G Expander:

The 6G Expander requires the sas2xfw.fw and mfg.bin binary files to update the firmware via in-band SAS interface on the system. You need to login to the local OS (CentOS) through the data network. The 6G Expander firmware update script uses Avago 6G XTools that support CentOS 6.x.

For example: Expander SAS ID is 570e28402007d0ff

1 Key in this command to update the expander firmware:

```
./xflash -i 570e28402007d0ff -y down fw sas2xfw.fw 1
./xflash -i 570e28402007d0ff -y down fw sas2xfw.fw 2
```

Wait for the flash process to finish.

2 Key in this command to update the expander configuration region:

```
./xflash -i 570e28402007d0ff -y down mfg mfg.bin 3
```

Wait for the flash process to finish.

3 Key in this command to reset the expander and apply the new expander firmware:

```
./xflash -i 570e28402007d0ff -y reset exp
```

Wait for at least one minute.

2.3 Sync Sensor Reading between BMC and Expander with IPMB

The Expander periodically synchronizes the temperature, voltage, current, and fan speed sensor reading with BMC via IPMB over I2C bus. There are two pairs of I2C buses used for communicating sensor synchronization between Expander and BMC.

2.4 Hardware Monitoring Sensors in Expander Overview

The Expander firmware automatically monitors the fans via hardware monitor chip and voltages, temperature, and current sensors.

The expander firmware periodically synchronizes most of those sensors with BMC via IPMB protocol over I2C bus.

3. Wiwynn-Specific Extensions

Wiwynn BMC will implement some OEM commands and parameters in order to support Wiwynn-specific features that are not defined in the IPMI specification. The goal is to keep this list to a minimum.

3.1 Wiwynn-Specific OEM Commands

The following table lists all the OEM commands and OEM extensions to standard IPMI commands that the BMC supports.

3.1.1 Retrieve Last 20x POST Codes

This command retrieves the last 20x POST codes from BMC.

Table 1. OEM command format to retrieve POST code

NetFn/LUN	1	30/00
Cmd	2	10
Request Data	3:5	00 2B 99 Wiwynn Manufacturer ID, LS Byte first
	6	01 Function Code
Response Data	1	Completion Code
	2	Post Code 1
	3	Post Code 2
	…	…
	21	Post Code 20

3.1.2 Specify Average Window for Each Host-BMC Power Query

This OEM command specifies the average window for each host-BMC power query; while the BMC should query ADM1178 regularly at a fix interval.

The fixed interval is 1 second for SV7110 BMC. This means that BMC will query ADM1178 once every second.

For example, if the OEM command specifies the average of ten 1-second windows, the BMC should report the average power of the last 10 readings to the host.

Table 2. Average power query OEM command format

NetFn/LUN	1	30/00
Cmd	2	21
Request Data	3:5	00 2B 99 Wiwynn Manufacturer ID, LS Byte first
	6	Specify average window (second)
Response Data	1	Completion Code
	2	Specify average window(second) return setting value for double check

3.1.3 Retrieve Serial Console Buffer

This command can retrieve last 5x screens of local and 5x screens of remote console output, 80 columns x 24 rows for each screen. Use text editor (notepad.txt) open combuffer.txt can display last 5x screen contents.

Table 3. Retrieve serial console buffer command

COM port	Command line
BMC debug COM	ipmitool fru read 101 combuff.txt
Host virtual COM	ipmitool fru read 104 combuffer.txt

3.1.4 Get Intel FPGA Code Version

Table 4. Get FPGA code version command format

NetFn/LUN	1	30/00
Cmd	2	55
Response Data	1	Completion Code
	2	Major number
	3	Minor number

3.1.5 Get IOC Firmware Version

This command retrieves the IOC firmware version.

Table 5. Get IOC FW version command format

NetFn/LUN	1	30/00
Cmd	2	56
Response Data	1	Completion Code
	2:4	FW version (Low byte is first byte)

3.1.6 Get Expander Firmware Version

This command retrieves the Expander firmware version.

Table 6. Get Expander firmware version command format

NetFn/LUN	1	30/00
Cmd	2	56
Response Data	1	Completion Code
	2:4	FW version (Low byte is first byte)

3.1.7 Set NTP Configuration

This command sets the NTP configuration.

Table 7. Set NTP configuration command format

NetFn/LUN	1	32/00		
Cmd	2	A8		
Request Data	3	1-Primary Server IP	2-Secondary Server IP	3-Enable / Disable NTP
	4:131	Primary Server IP	Secondary Server IP	1- Enable / 0-Disable
Response Data	1	Completion Code: 00h = success cch = Invalid Data Field c1h = Invalid Command c7h = Invalid Data Length ffh = Unspecified Error		

3.1.8 Get NTP Configuration

This command retrieves the NTP configuration.

Table 8. Get NTP configuration command format

NetFn/LUN	1	32/00
Cmd	2	A7
Response Data	1	Completion Code: 00h = success cch = Invalid Data Field c1h = Invalid Command c7h = Invalid Data Length ffh = Unspecified Error
	2	Enable/Disable Status of NTP
	3:130	Primary Server IP, MSB first
	131:258	Secondary Server IP, MSB first

3.1.9 Get IPv6 LAN Configuration

This command retrieves the IPv6 LAN configuration.

Table 9. Get IPv6 LAN configuration command format

NetFn/LUN	1	0C/00
Cmd	2	02
Request Data	3	[7] - 0b = get parameter 1b = get parameter revision only. [6:4] - reserved [3:0] - Channel number.
	4	Parameter selector (greater than 192 is OEM index)
	5	Set Selector. Selects a given set of parameters under a given Parameter selector value (00h if parameter does not use a Set Selector).

	6	Block Selector (00h if parameter does not require a block number)
Response Data	1	Completion Code
	2	[7:0] - Parameter revision.
	3:N	Configuration parameter data

3.1.10 Set IPv6 LAN Configuration

This command sets the IPv6 LAN configuration.

Table 10. Set IPv6 LAN configuration command format

NetFn/LUN	1	0C/00
Cmd	2	01
Request Data	3	[7:4] - reserved [3:0] - Channel number.
	4	Parameter selector (bigger than 192 is OEM index)
	5:N	Configuration parameter data
Response Data	1	Completion Code

3.1.11 AMI LAN Configuration OEM Parameter

Table 11. LAN configuration OEM parameter

Parameter	#	Parameter data
IPv6 IP Address source	196	Data 1 - Address source 0h = unspecified 1h = static address 2h = DHCP
IPv6 IP Address	197	While Setting: Data 1 - Index value (0x01 for 10G interface in SV7110) Data 2:17 - 16 bytes of IPv6 address. MS-byte first. While Getting: Data 1:16 - 16 bytes of IPv6 address. MS-byte first.
Prefix Length	198	While Setting: Data 1 - Index value (0x01 for 10G interface in SV7110) Data 2 - Prefix length should be from 0 to 128 as per IPv6 spec. While Getting: Data 1 - Prefix length.
IPv6 Default Gateway	199	Data 1:16 - 16 bytes IPv6 gateway address. MS-byte first.

4. Network Communications

4.1 Management Network Interface

BMC is designed to support both SMBUS sideband port and RMII/NCSI port for Out-Of-Band access.

BMC firmware is flexible about which interface and device to activate by hardware strapping or a preset priority policy (now set to NCSI only). BMC firmware needs to make sure that unused interfaces and devices are disabled and do not interfere with the activated management interface and device.

BMC management network firmware and utility support all features defined in this specification in both IPv4 and IPv6 network environment.

4.2 Management Network Interface Features

- BMC out-of-band access: I2C port
- BMC Out-Of-Band access- RMII/NCSI port
- BMC management network firmware and utility support all features defined in this specification in both IPv4 and IPv6 network environments.
- BMC firmware needs to be flexible about which interface and device to activate by hardware strapping or a preset priority policy.
- BMC firmware needs to make sure that unused interfaces and devices are disabled and do not interfere with the activated management interface and device.

5. Local Serial Console Redirection and Serial Over LAN

Wiwynn BMC is designed to support two paths for accessing the serial console. Both interfaces are functional at all stages of system operation.

- A local serial console on debug header / debug card, as described in this specification.
- A remote console, also known as Serial-over-LAN (SoL) through management network described in section 4.1.

5.1 Local Serial Console and SoL Features

- Requires a serial console buffer feature
- A buffer needs to save at least last 5x local screens and 5x remote console output screens with a resolution of 80 columns x 24 rows for each screen.
- Use OOB raw command to extract and display the buffer.
- Store buffer in volatile media such as the BMC's internal or external SDRAM. Buffer data is cleared within 5 seconds upon removal of standby power. Buffer should **NOT** be stored in any non-volatile media.
- During system boot, POST codes are sent to Port 80 and decoded by BMC to drive the LED display on debug card. POST codes should be displayed in the SoL console during system POST.

- Before the system has the first screen, POST codes are dumped to and displayed in the SoL console in sequence. After the system has the first screen in SoL console, the last POST code received on Port 80 is displayed on the lower right corner of the SoL console screen.
- BMC controls the switching of console input and output between SoL and Local on the fly. In case of legacy limitation wherein only one interface is functional, the default is set to Local.
- When UART console switch is changed to channel 01, BMC is able to identify this action and switches the console back to Local to re-enable local console access.
- BMC needs to support two paths to access the serial console (Local and SoL). A local serial console on the debug header and a remote console, also known as Serial-over-LAN (SoL) that works through management network. It is preferred that both interfaces are functional at all stages of system operation.

6. Supported SELs, System Sensors and Thermal Protection

6.1 System Sensors

BMC has access to all analog sensors, discrete sensors and event-only sensors on the SV7110 baseboard and Panther+ card (through I2C management interface from FPGA). All connected sensors are displayed in the sensor data record (SDR) repository.

The following table shows the supported sensors. Note that the lower and upper critical thresholds are listed for system event logging purpose.

6.1.1 Discrete Sensors

Table 12. Discrete Sensors

Sensor No.	1
Name	Processor (CPU Status)
Entity ID	03h
SDR/Type	02h
Sensor Type	Processor
Sensor Type Codes	07h
Sensor Reading Type	6Fh
Assertion	00h-IERR 01h-Thermal Trip 02h-FRB1/BIST failure 03h-FRB2/Hang in POST failure 04h-FRB3/Processor Startup/Initialization failure (CPU didn't start) 05h-Configuration Error 06h-SM BIOS 'Uncorrectable CPU-complex Error' 07h-Processor Presence detected

	08h-Processor disabled 09h-Terminator Presence Detected 0Ah-Processor Automatically Throttled 0Bh-Machine Check ERR 0Ch-Correctable Machine Check Error
Sensor No.	**2**
Name	System FW
Entity ID	22h
SDR/Type	02h
Sensor Type	System Firmware Progress
Sensor Type Codes	0fh
Sensor Reading Type	6Fh
Assertion	System Firmware Error (POST Error): 01h- No system memory is physically installed in the system. 02h- No usable system memory, all installed memory has experienced an unrecoverable failure. 03h- Unrecoverable hard-disk/ATAPI/IDE device failure. 07h- Unrecoverable PS/2 or USB keyboard failure. 08h- Removable boot media not found. 0Ah- No video device detected. 0Bh- Firmware (BIOS) ROM corruption detected.
Sensor No.	**3**
Name	CPU ERR
Entity ID	03h
SDR/Type	02h
Sensor Type	Critical Interrupt
Sensor Type Codes	13h
Sensor No.	**5**
Name	DIMM A0 Correctable ECC
Entity ID	20h
SDR/Type	02h
Sensor Type	Memory
Sensor Type	0Ch

Codes	
Sensor No.	**6**
Name	DIMM B0 Correctable ECC
Entity ID	20h
SDR/Type	02h
Sensor Type	Memory
Sensor Type Codes	0Ch
Sensor No.	**7**
Name	DIMM A1 Correctable ECC
Entity ID	20h
SDR/Type	02h
Sensor Type	Memory
Sensor Type Codes	0Ch
Sensor No.	**8**
Name	DIMM B1 Correctable ECC
Entity ID	20h
SDR/Type	02h
Sensor Type	Memory
Sensor Type Codes	0Ch
Sensor No.	**9**
Name	Memory
Entity ID	20h
SDR/Type	02h
Sensor Type	Memory
Sensor Type Codes	0Ch
Sensor Reading Type	6Fh
Assertion	00h-Correctable ECC 01h-Uncorrectable ECC 02h-Parity

	03h-Memory Scrub Failed 04h-Memory Device Disabled 05h-Correctable ECC / other correctable memory error logging limit reached
Sensor No.	**13**
Name	Event Log
Entity ID	21h
SDR/Type	2
Sensor Type	Event Logging Disabled
Sensor Type Codes	10h
Sensor Reading Type	0Fh
Assertion	02h – Log Area Reset/Cleared 04h – SEL Full 05h – SEL Almost Full
Sensor No.	**14**
Name	Watchdog2
Entity ID	21h
SDR/Type	2
Sensor Type	Watchdog 2
Sensor Type Codes	23h
Sensor Reading Type	6Fh
Assertion	00h – Timer Expired 01h – Hard Reset 02h – Power Down 03h – Power Cycle 08h – Timer Interrupt
Sensor No.	**206**
Name	System Event
Entity ID	22h
SDR/Type	2
Sensor Type	System Event

Sensor Type Codes	12h
Sensor Reading Type	6Fh
Assertion	00h – System Reconfigured00h – System Reconfigured 01h –OEM System Boot Event 02h – Undetermined System hardware fail 03h – Entry added to Auxiliary Log 04h – PEF Action 05h – Timestamp Clock Synch
Sensor No.	**210**
Name	VR HOT
Entity ID	
SDR/Type	2
Sensor Type	OEM
Sensor Type Codes	c0h
Sensor Reading Type	6Fh
Sensor No.	**211**
Name	Temp Alert
Entity ID	
SDR/Type	2
Sensor Type	OEM
Sensor Type Codes	c0h
Sensor Reading Type	6Fh
Assertion	
Sensor No.	**212**
Name	PCIE
Entity ID	24h
SDR/Type	2
Sensor Type	Critical Interrupt
Sensor Type	13h

Codes	
Sensor Reading Type	6Fh
Assertion	

6.1.2 Analog Sensors

Table 13. Analog Sensors for Fan

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
21	Fan 1 Front	1Dh	01h	Fan	04h	01h	1500.000	13000.000
22	Fan 1 Rear	1Dh	01h	Fan	04h	01h	1300.000	12000.000
23	Fan 2 Front	1Dh	01h	Fan	04h	01h	1500.000	13000.000
24	Fan 2 Rear	1Dh	01h	Fan	04h	01h	1300.000	12000.000
25	Fan 3 Front	1Dh	01h	Fan	04h	01h	1500.000	13000.000
26	Fan 3 Rear	1Dh	01h	Fan	04h	01h	1300.000	12000.000
27	Fan 4 Front	1Dh	01h	Fan	04h	01h	1500.000	13000.000
28	Fan 4 Rear	1Dh	01h	Fan	04h	01h	1300.000	12000.000
29	Fan 5 Front	1Dh	01h	Fan	04h	01h	1500.000	13000.000
30	Fan 5 Rear	1Dh	01h	Fan	04h	01h	1300.000	12000.000
31	Fan 6 Front	1Dh	01h	Fan	04h	01h	1500.000	13000.000
32	Fan 6 Rear	1Dh	01h	Fan	04h	01h	1300.000	12000.000

Table 14. Analog Sensors for FCB

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
52	FCB Voltage 12.5V_1	0ah	01h	Voltage	02h	01h	11.220	13.740
53	FCB Voltage 12.5V_2	0ah	01h	Voltage	02h	01h	11.220	13.740
54	FCB Voltage 12.5V_3	0ah	01h	Voltage	02h	01h	11.220	13.740
55	FCB Voltage 3.3V	0ah	01h	Voltage	02h	01h	2.960	3.620
56	FCB Current	0ah	01h	Current	03h	01h	NA	59.920
57	FCB Power	0ah	01h	Power Supply	08h	01h	0.000	1020.000

Table 15. Analog Sensors for PPC

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
200	PPC Board Temp	10h	01h	Temperature	01h	01h	0.000	75.000
58	PPC Voltage VCCP	10h	01h	Voltage	02h	01h	0.510	1.303
59	PPC Voltage VNN	10h	01h	Voltage	02h	01h	0.510	1.303
60	PPC Voltage 1.0V	10h	01h	Voltage	02h	01h	0.902	1.107
61	PPC Voltage 1.35V	10h	01h	Voltage	02h	01h	1.215	1.490
62	PPC Voltage 1.8V	10h	01h	Voltage	02h	01h	1.627	1.989
63	PPC Voltage 12.5V	10h	01h	Voltage	02h	01h	11.286	13.770
64	PPC Voltage 3.3V_MAIN	10h	01h	Voltage	02h	01h	2.940	3.646
65	PPC Voltage 3.3V_STBY	10h	01h	Voltage	02h	01h	2.940	3.646
202	PPC Current	10h	01h	Current	03h	01h	NA	5.610

90	PPC CPU Temp	06h	01h	Temperature	01h	01h	0.000	90.000
91	PPC DIMM A0 Temp	20h	01h	Temperature	01h	01h	0.000	82.000
92	PPC DIMM A1 Temp	20h	01h	Temperature	01h	01h	0.000	82.000
93	PPC DIMM B0 Temp	20h	01h	Temperature	01h	01h	0.000	82.000
94	PPC DIMM B1 Temp	20h	01h	Temperature	01h	01h	0.000	82.000

Table 16. Analog Sensors for DPB

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
75	DPB Voltage 5V_1	0Fh	01h	Voltage	02h	01h	4.480	5.440
76	DPB Voltage 5V_2	0Fh	01h	Voltage	02h	01h	4.480	5.440
77	DPB Voltage 5V_3	0Fh	01h	Voltage	02h	01h	4.480	5.440
78	DPB Voltage 12.5V	0Fh	01h	Voltage	02h	01h	11.232	13.728
79	DPB Temp 1	0Fh	01h	Temperature	01h	01h	0.000	55.000
80	DPB Temp 2	0Fh	01h	Temperature	01h	01h	0.000	55.000
81	DPB Temp 3	0Fh	01h	Temperature	01h	01h	0.000	55.000
82	DPB Temp 4	0Fh	01h	Temperature	01h	01h	0.000	55.000

Table 17. Analog Sensors for SV7110 Board

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
66	HBB Voltage 12.5V	07h	01h	Voltage	02h	01h	11.264	13.760
67	HBB Voltage 5V_STBY	07h	01h	Voltage	02h	01h	4.536	5.502
68	HBB Voltage 3.3V_STBY	07h	01h	Voltage	02h	01h	2.984	3.647
69	HBB Voltage 1.8V_STBY	07h	01h	Voltage	02h	01h	1.630	1.989
70	HBB Voltage 1.5V	07h	01h	Voltage	02h	01h	1.358	1.659
71	HBB Voltage 0.9V_CTRL	07h	01h	Voltage	02h	01h	0.863	1.057
72	HBB Voltage 0.9V_EXP	07h	01h	Voltage	02h	01h	0.815	0.999
74	HBB Current	07h	02h	Current	03h	01h	NA	8.160
240	HBB Voltage 1.5EXP	07h	01h	Voltage	02h	01h	1.358	1.659
83	HBB Ambient Temp	07h	01h	Temperature	01h	01h	0.000	50.000
84	HBB Expander Temp	09h	01h	Temperature	01h	01h	0.000	95.000
85	HBB IOC Temp	09h	01h	Temperature	01h	01h	0.000	95.000
215	System Out Temp	21h	01h	Temperature	01h	01h	0.000	75.000
151	Mezz Amb Temp	07h	01h	Temperature	01h	01h	0.000	60.000
152	IOC Ambient Temp	07h	01h	Temperature	01h	01h	0.000	70.000
153	ExpanderAmb Temp	07h	01h	Temperature	01h	01h	0.000	70.000

Table 18. Analog Sensors for FCB

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
87	BJT Temp. Sensor 1	0ah	01h	Temperature	01h	01h	0.000	55.000
88	BJT Temp. Sensor 2	0ah	01h	Temperature	01h	01h	0.000	55.000

Table 19. Analog Sensors for Power

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
119	PPC Watt	15h	01h	Power Supply	02h	01h	NA	32.385
120	HBB PWR	15h	01h	Power Supply	02h	01h	NA	64.770

Table 20. Analog Sensors for DPB HDD

Sensor No.	Name	Entity ID	SDR/ Type	Sensor Type	Sensor Type Codes	Sensor Reading Type	LNC	UNC
100	HDD SMART Temp. 00	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
101	HDD SMART Temp. 01	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
102	HDD SMART Temp. 02	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
103	HDD SMART Temp. 03	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
104	HDD SMART Temp. 04	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
105	HDD SMART Temp. 05	04h	01h	Drive Slot	0Dh	01h	5.000	65.000

106	HDD SMART Temp. 06	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
107	HDD SMART Temp. 07	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
108	HDD SMART Temp. 08	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
109	HDD SMART Temp. 09	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
110	HDD SMART Temp. 10	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
111	HDD SMART Temp. 11	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
112	HDD SMART Temp. 12	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
113	HDD SMART Temp. 13	04h	01h	Drive Slot	0Dh	01h	5.000	65.000
114	HDD SMART Temp. 14	04h	01h	Drive Slot	0Dh	01h	5.000	65.000

6.2 System Event Log

Table 21. Supported System Event Log (SEL)

Sensor No.	**1**
Name	Processor (CPU Status)
Sensor Type	Processor
Sensor Type Codes	07h
Event Data 1	00h-IERR 01h-Thermal Trip 02h-FRB1/BIST failure 03h-FRB2/Hang in POST failure 04h-FRB3/Processor Startup/Initialization failure (CPU didn't start) 05h-Configuration Error 06h-SM BIOS 'Uncorrectable CPU-complex Error' 07h-Processor Presence detected 08h-Processor disabled 09h-Terminator Presence Detected 0Ah-Processor Automatically Throttled 0Bh-Machine Check ERR 0Ch-Correctable Machine Check Error
Sensor No.	**2**
Name	SystemFW
Sensor Type	System Firmware Progress
Sensor Type Codes	0Fh
Event Data 1	System Firmware Error (POST Error): 01h No system memory is physically installed in the system. 02h No usable system memory, all installed memory has experienced an unrecoverable failure. 03h Unrecoverable hard-disk/ATAPI/IDE device failure. 07h Unrecoverable PS/2 or USB keyboard failure. 08h Removable boot media not found 0Ah No video device detected 0Bh Firmware (BIOS) ROM corruption detected
Sensor No.	**5**
Name	DIMM A0 Correctable ECC
Sensor Type	Memory

Sensor Type Codes	0Ch
Event Data 1	00h-Correctable ECC
Sensor No.	**6**
Name	DIMM B0 Correctable ECC
Sensor Type	Memory
Sensor Type Codes	0Ch
Event Data 1	00h-Correctable ECC
Sensor No.	**7**
Name	DIMM A1 Correctable ECC
Sensor Type	Memory
Sensor Type Codes	0Ch
Event Data 1	00h-Correctable ECC
Sensor No.	**8**
Name	DIMM B1 Correctable ECC
Sensor Type	Memory
Sensor Type Codes	0Ch
Event Data 1	00h-Correctable ECC
Sensor No.	**9**
Name	Memory
Sensor Type	Memory
Sensor Type Codes	0Ch
Event Data 1	01h-Uncorrectable ECC 02h-Parity 03h-Memory Scrub Failed 04h-Memory Device Disabled 05h-Correctable ECC / other correctable memory error logging limit reached
Sensor No.	**0x00**
Name	POST Err.

Sensor Type	System Firmware Progress
Sensor Type Codes	0x0f
Event Data 1	[7:6]= 10b, LSB of POST Error Code or 11b, Per IPMI Spec [5:4]=10b [3:0]=00b,Firmware Error
Event Data 2	If ED1[7:6]=11b, ED2[7:0]= 01h, No system memory is physically installed in the system 02h, No usable system memory 03h, Unrecoverable hard-disk/ATAPI/IDE device failure 07h, Unrecoverable PS/2 or USB keyboard failure 08h, Removable boot media not found 0Bh, Firmware (BIOS) ROM corruption detected
Sensor No.	**0x01**
Name	Machine Chk Err
Sensor Type	Processor
Sensor Type Codes	0x07
Event Data 1	[7:6]=10b [5:4]=10b [3:0]=0Bh, Uncorrectable Or 0Ch, Correctable
Event Data 2	Error Code ID 0x00= Bus Interface Unit 0x01= Bus Interface Unit 0x02= Level-2 shared 1-MB Cache 0x03= Memory Execution Cluster 0x04= Front-End Cluster, includes the Instruction Cache 0x05= SoC System Agent
Event Data 3	[7:5] CPU # [4:3] Source 00b = check Error Code ID 01b = LLC [2:0], if LLC, Core #
Sensor No.	**13**
Name	Event Log

Sensor Type	Event Logging Disabled
Sensor Type Codes	10h
Event Data 1	02h – Log Area Reset/Cleared 04h – SEL Full 05h – SEL Almost Full
Sensor No.	**14**
Name	Watchdog2
Sensor Type	Watchdog 2
Sensor Type Codes	23h
Event Data 1	00h – Timer Expired 01h – Hard Reset 02h – Power Down 03h – Power Cycle 08h – Timer Interrupt
Event Data 2	[7:4] interrupt type 0h = none 1h = SMI 2h = NMI 3h = Messaging Interrupt Fh = unspecified all other = reserved [3:0] timer use at expiration: 0h = reserved 1h = BIOS FRB2 2h = BIOS/POST 3h = OS Load 4h = SMS/OS 5h = OEM Fh = unspecified
Sensor No.	**206**
Name	System Event
Sensor Type	System Event
Sensor Type Codes	12h

Event Data 1	00h – System Reconfigured 01h –OEM System Boot Event 02h – Undetermined System hardware fail 03h – Entry added to Auxiliary Log 04h – PEF Action 05h – Timestamp Clock Synch
Sensor No.	**210**
Name	VR_HOT
Sensor Type	OEM
Sensor Type Codes	c0h
Event Data 1	00h-VRhot
Sensor No.	**211**
Name	Temp_Alert
Sensor Type	OEM
Sensor Type Codes	c0h
Event Data 1	00h-OEM Temp Alert
Event Data 2	N/A
Event Data 3	N/A
Sensor No.	**212**
Name	PCIE
Sensor Type	Critical Interrupt
Sensor Type Codes	13h
Event Data 1	07h-Bus Correctable Error 08h-Bus Uncorrectable Error 09h-Fatal NMI (port 61h, bit 7) 0Ah-Bus Fatal Error
Event Data 2	[2:0] Function # [7:3] Device #
Event Data 3	[7:0] Bus #
Sensor No.	**21**
Name	Fan 1 Front

Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**22**
Name	Fan 1 Rear
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**23**
Name	Fan 2 Front
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**24**
Name	Fan 2 Rear
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**25**
Name	Fan 3 Front
Sensor Type	Fan

Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**26**
Name	Fan 3 Rear
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**27**
Name	Fan 4 Front
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**28**
Name	Fan 4 Rear
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**29**
Name	Fan 5 Front
Sensor Type	Fan
Sensor Type	04h

Codes	
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**30**
Name	Fan 5 Rear
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**31**
Name	Fan 6 Front
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**32**
Name	Fan 6 Rear
Sensor Type	Fan
Sensor Type Codes	04h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**52**
Name	FCB Voltage 12.5V_1
Sensor Type	Voltage
Sensor Type Codes	02h

Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**53**
Name	FCB Voltage 12.5V_2
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**54**
Name	FCB Voltage 12.5V_3
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**55**
Name	FCB Voltage 3.3V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**56**
Name	FCB Current
Sensor Type	Current
Sensor Type Codes	03h
Event Data 1	[7:6] - 01b = trigger reading in byte 2

Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**57**
Name	FCB Power
Sensor Type	Power Supply
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**200**
Name	PPC Ambient Temp
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**58**
Name	PPC Voltage VCCP
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**59**
Name	PPC Voltage VNN
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event

Event Data 3	Threshold value that triggered event
Sensor No.	**60**
Name	PPC Voltage 1.0V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**61**
Name	PPC Voltage 1.35V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**62**
Name	PPC Voltage 1.8V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**63**
Name	PPC Voltage 12.5V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	64
Name	PPC Voltage 3.3V_MAIN
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**65**
Name	PPC Voltage 3.3V_STBY
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**202**
Name	PPC Current
Sensor Type	Current
Sensor Type Codes	03h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**90**
Name	PPC CPU Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**91**

Name	PPC DIMM A0 Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**92**
Name	PPC DIMM A1 Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**93**
Name	PPC DIMM B0 Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**94**
Name	PPC DIMM B1 Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**75**
Name	DPB Voltage 5V_1

Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**76**
Name	DPB Voltage 5V_2
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**77**
Name	DPB Voltage 5V_3
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**78**
Name	DPB Voltage 12.5V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**79**
Name	DPB Temp. Sensor 1
Sensor Type	Temperature

Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**80**
Name	DPB Temp. Sensor 2
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**81**
Name	DPB Temp. Sensor 3
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**82**
Name	DPB Temp. Sensor 4
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**66**
Name	HBB Voltage 12.5V
Sensor Type	Voltage
Sensor Type	01h

Codes	
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**67**
Name	HBB Voltage 5V_STBY
Sensor Type	Voltage
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**68**
Name	HBB Voltage 3.3V_STB
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**69**
Name	HBB Voltage 1.8V_STBY
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**70**
Name	HBB Voltage 1.5V
Sensor Type	Voltage
Sensor Type Codes	02h

Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**71**
Name	HBB Voltage 0.9V_CTRL
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**72**
Name	HBB Voltage 0.9V_EXP
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**73**
Name	HB Voltage 12V
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**74**
Name	HB Current
Sensor Type	Current
Sensor Type Codes	03h
Event Data 1	[7:6] - 01b = trigger reading in byte 2

Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**240**
Name	HBB Voltage 1.5EXP
Sensor Type	Voltage
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**83**
Name	HBB Ambient Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**84**
Name	HBB Expander Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**85**
Name	HBB SAS CTRL Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event

Event Data 3	Threshold value that triggered event
Sensor No.	**86**
Name	HBB Local Temp. Sensor
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**215**
Name	HBB Outlet Temp
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**151**
Name	10G Ambient
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**152**
Name	SAS Ambient
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	153
Name	Exp Ambient
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**87**
Name	BJT Temp. Sensor 1
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**88**
Name	BJT Temp. Sensor 2
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**100**
Name	HDD SMART Temp. 00
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	101
Name	HDD SMART Temp. 01
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**102**
Name	HDD SMART Temp. 02
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**103**
Name	HDD SMART Temp. 03
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**104**
Name	HDD SMART Temp. 04
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	105
Name	HDD SMART Temp. 05
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**106**
Name	HDD SMART Temp. 06
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**107**
Name	HDD SMART Temp. 07
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**108**
Name	HDD SMART Temp. 08
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	109
Name	HDD SMART Temp. 09
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**110**
Name	HDD SMART Temp. 10
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**111**
Name	HDD SMART Temp. 11
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**112**
Name	HDD SMART Temp. 12
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	113
Name	HDD SMART Temp. 13
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**114**
Name	HDD SMART Temp. 14
Sensor Type	Temperature
Sensor Type Codes	01h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**119**
Name	PPC Watt
Sensor Type	Power Supply
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event
Sensor No.	**120**
Name	HBB Watt
Sensor Type	Power Supply
Sensor Type Codes	02h
Event Data 1	[7:6] - 01b = trigger reading in byte 2
Event Data 2	Reading that triggered event
Event Data 3	Threshold value that triggered event

Sensor No.	0
Name	Expander protocol error
Sensor Type	OEM
Sensor Type Codes	C0h
Event Data 1	20h
Event Data 2	ffh
Event Data 3	ffh
Sensor No.	**0**
Name	IOC FW update event
Sensor Type	Version Change
Sensor Type Codes	2Bh
Event Data 1	07h-Software or F/W Change detected with associated Entity was successful.
Event Data 2	08h-other management controller firmware
Event Data 3	01h
Sensor No.	**0**
Name	Expander FW update event
Sensor Type	Version Change
Sensor Type Codes	2Bh
Event Data 1	07h-Software or F/W Change detected with associated Entity was successful.
Event Data 2	08h-other management controller firmware
Event Data 3	02h
Sensor No.	**0**
Name	BIOS FW update event
Sensor Type	Version Change
Sensor Type Codes	2Bh
Event Data 1	07h-Software or F/W Change detected with associated Entity was successful.
Event Data 2	09h-system firmware (EFI / BIOS) change

Event Data 3	N/A
Sensor No.	**0**
Name	NIC update FW event
Sensor Type	Version Change
Sensor Type Codes	2Bh
Event Data 1	07h-Software or F/W Change detected with associated Entity was successful.
Event Data 2	09h-system firmware (EFI / BIOS) change
Event Data 3	03h
Sensor No.	**0**
Name	BMC warm reset event
Sensor Type	OEM
Sensor Type Codes	C1h
Event Data 1	0h
Event Data 2	N/A
Event Data 3	N/A
Sensor No.	**0**
Name	BMC cold reset event
Sensor Type	OEM
Sensor Type Codes	C1h
Event Data 1	1h
Event Data 2	N/A
Event Data 3	N/A

7. Chassis Cooling Control

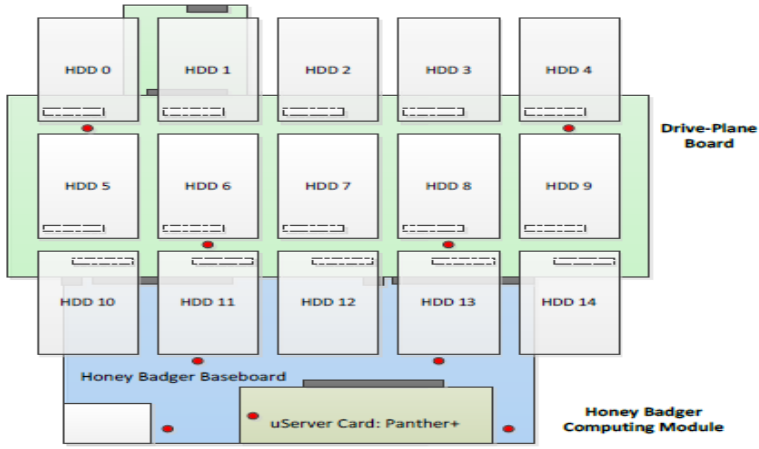
7.1 Fan Speed Control

The SV7110 Baseboard BMC is responsible for fan speed control. The control algorithm is based on the information and thermal profile of the selected temperature sensors.

The key sensors that are considered in fan speed control algorithm are:

- SV7110 computing module
  - One ambient temperature sensor on Panther+ card
  - Two ambient temperature sensors on SV7110 Baseboard, for inlet temperature (LM421, Local and Remote)
  - Three ambient temperature sensors and two temperature sensor form SAS IOC and Expander on SV7110 baseboard, for hot spot temperature (behind SAS expander, SAS controller, or 10GbE card, etc.)
- Open vault storage system enclosure
  - Four ambient temperature sensors on the drive plane board

The following figure shows the locations of the temperature sensors:



The SV7110 thermal control is designed to ensure that the temperatures of all on-board key components (Intel Atom CPU, SAS controller, SAS expander, etc.) and system components (such as hard disks) must meet the thermal requirements with enough margins in all operating environment temperature ranges.