Introduction to server BMC knowledge

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Category Column: SI Article Tags: server Operations

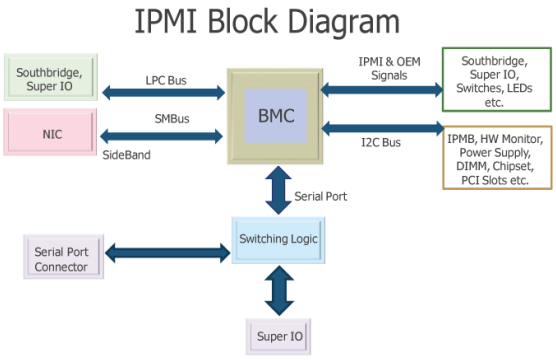
Before introducing BMC, you need to understand a concept, namely platform management.

Platform management refers to a series of monitoring and control functions, and the object of operation is the system hardware. For example, by monitoring the system's temperature, voltage, fan, power supply, etc., and making corresponding adjustments, the system is kept in a healthy state. Of course, if the system is really abnormal, it can also be restarted by resetting it. At the same time, platform management is also responsible for recording various hardware information and log records to prompt users and locate subsequent problems. The above functions can be integrated into a controller, which is called the Baseboard Manager Controller (BMC).

It should be noted that BMC is an independent system. It does not rely on other hardware on the system (such as CPU, memory, etc.), nor does it rely on BIOS, OS, etc. (but BMC can interact with BIOS and OS, which can play a better role in platform management. There is system management software under OS that can work with BMC to achieve better management effects).

Generally, our computers do not have BMCs because they are not very useful. The management of temperature, power, etc. is controlled by the CPU (or EC, which is another topic). However, for devices with high system requirements, such as servers, BMCs are used. Of course, because BMC is an independent system, for some embedded devices, other processors may not be needed, and a BMC alone can complete the work.

After all, BMC itself is also a small system with an out-of-band processor (usually an ARM processor), and it is completely possible to use it alone to handle certain tasks. However, since it is called BMC here, the focus is generally on platform management, so this article mainly talks about the BMC in the server. The position of BMC in the system is roughly shown in the following figure:



The BMC is connected to other components in the system through different interfaces.

LPC, I2C, SMBUS, Serial, etc., these are relatively basic interfaces, while IPMI is a bus that matches the BMC. All BMCs need to implement this interface, which requires special introduction here.

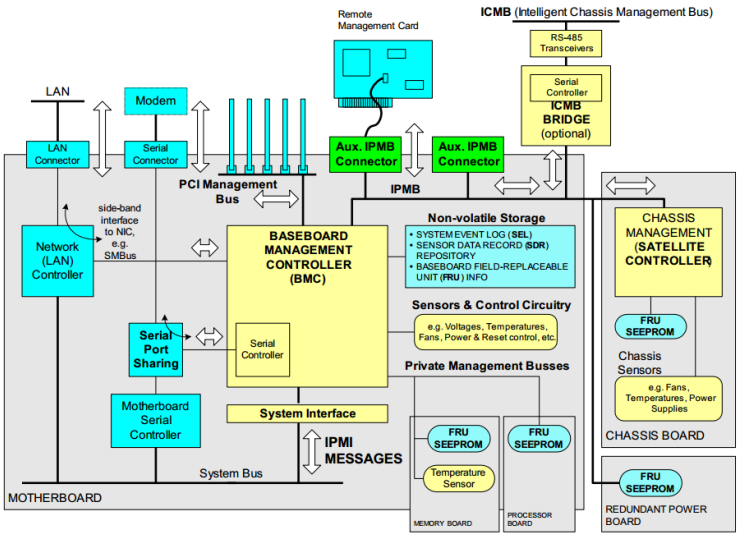
IPMI
The full name of IPMI is Intelligent Platform Management Interface.

There is no need to introduce what it is used for after seeing the name. For a detailed introduction, please refer to https://www.intel.com/content/www/us/en/servers/ipmi/ipmi-home.html. Here we will only give a brief introduction.

IPMI specifies many things, among which BMC is the most important part. In addition, there are some "satellite" controllers connected to BMC through IPMB. These "satellite" controllers generally control specific devices.

IPMB stands for Intelligent Platform Management Bus, which is an I2C-based serial bus used for communication between BMC and "satellite" controllers, and transmits IPMI commands on it.

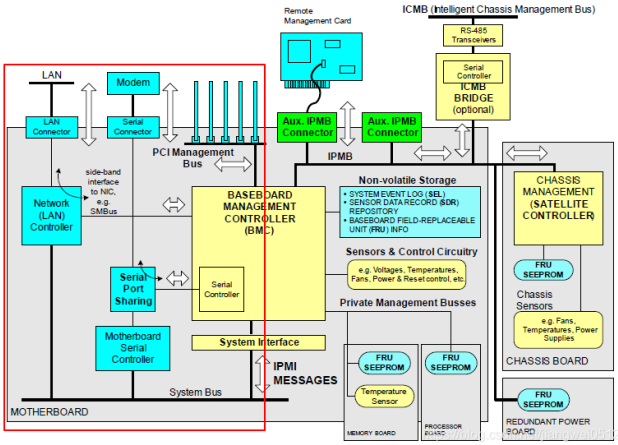
The following figure describes the various modules related to IPMI:



The following is a brief introduction to each part.

MOTHERBOARD

First is the lower left corner of the picture, where the name says Mother Board.



Usually, in the server, this part is the protagonist, which includes the main components such as CPU and PCH.

Here we can see that in addition to connecting several components: the network card, serial port and IPMI bus, there is actually another part in the PCI bus in the top middle of the picture.

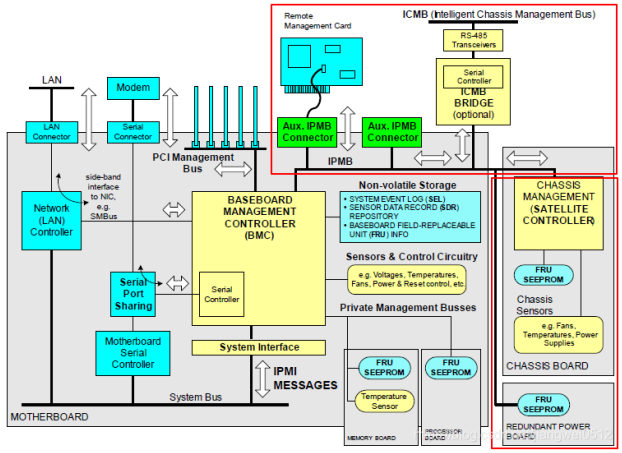
Network card: The server needs a network card. There is nothing much to introduce about this itself. The focus is actually on the connection from BMC to the network card, which will be introduced later.

Serial port: The serial port is used to output the debugging information of the server, but it is worth noting that Serial Port Sharing allows the server's serial port output to be output directly or to the BMC. As for why it is necessary to output to the BMC, it is actually necessary to pay attention to a common scenario. The server is located in the computer room, and the staff usually do not operate directly in the computer room, but through the network (this is why the BMC is connected to the network card). At this time, if you need to obtain the server's serial port information, it is not convenient to go directly to the computer room. At this time, it is a good idea to obtain the server's serial port information through the BMC.

IPMI bus: This is the main body for BMC to communicate with and control the server, and of course it is indispensable.

PCI bus: This part is very similar to the serial port. In addition to outputting serial port information, the server also needs to output things like graphical interfaces. From the server side, it is connected to a graphics card through PCI, through which it outputs the display.

IPMB
then moves to the upper right corner of the diagram, which depicts the devices connected via IPMB.

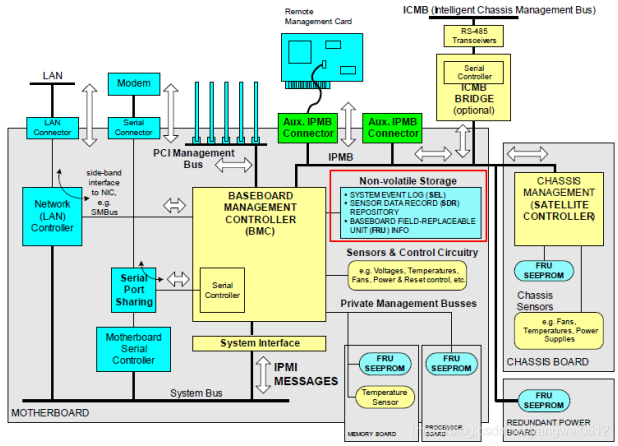


These devices are similar to BMC and are also used to manage chips.

They complement the BMC and thus extend the functionality of the BMC.

Non-volatile Storage
We know that BMC is actually an independent chip, so it must also run the system.

A Unix-like system runs in the BMC, and the system is stored in the Non-volatile Storage, usually in the SPI Flash.

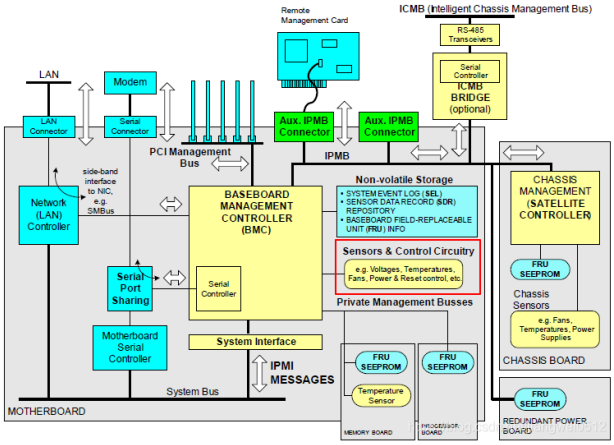


There is no essential difference from general storage media.

In addition to the system itself, it also contains a series of information that the BMC will store.

For example, serial port information obtained from the server; alarm information of the system itself; FRU information, etc.

Although the Sensors & Control Circuitry
section only occupies a small part of the figure, it is the most basic function of BMC: obtaining information and controlling the environment.

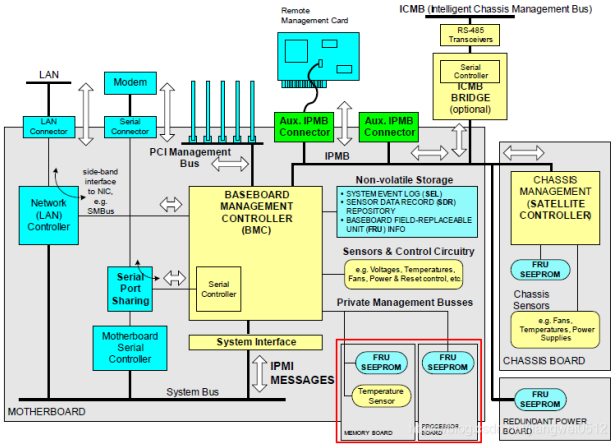


BMC will obtain the temperature of the device through buses such as I2C/PECI, and then adjust the temperature according to pre-set strategies.

There are two ways to adjust. One is to adjust the fan, which is active cooling; the other is to adjust the power supply, such as the P state of the CPU, or shut down unnecessary hard drives, which is passive cooling.

FRU

FRU stands for Field Replaceable Unit.



It can also be seen from the figure that components like memory sticks and CPUs are FRUs, and they are usually replaceable in servers.

The BMC will detect these devices and save the relevant information.

When the status of these devices changes, the BMC will generate relevant alarms.