

# What On Earth Is IPMI?

For Wolverhampton Linux User Group



By Adam Sweet

# What On Earth Is IPMI?

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# What is IPMI?

IPMI is:

- Intelligent Platform Management Interface
- A specification created by an Intel led committee to create common interface for out-of-band hardware management
- Independent of the Operating System
- Works over UDP port 623 using RMCP (Remote Management Control Protocol), or locally via kernel drivers
- Only available on server hardware which supports it and is similar to LOM (Lights Out Management) and ILO
- Has CLI tools which is similar to the Cisco IOS CLI and some (normally proprietary) GUI tools
- IPMI requires a hardware device called a BMC (Baseboard Management Controller), either built-in to the motherboard or as a daughter card

# What Can I Do With It?

## The primary benefits of IPMI:

- View server chassis and motherboard sensor output remotely, such as power status, chassis intrusion detection, fan speeds and motherboard temperatures
- Ability to remotely power on, power off, reboot the server and flash the identification light whether the OS is running or not
- Use SNMP to send Platform Event Traps
- Ability to run a console on a serial port and redirect the console over a network interface, which with BIOS and bootloader console redirection, lets you view the BIOS, bootloader, the bootup and shutdown procedures and console output remotely even if the OS dies. This is called Serial Over Lan (SOL)
- The BMC works regardless of whether the OS is operational or whether the machine is powered on, so long as there is power available

# What Can I Do With It?

- The point of IPMI for **me** is:
- I can reboot and power machines on or off remotely when the OS hangs, without paying for an IP addressable Power Distribution Unit (PDU)
- A PDU only lets you choose whether to supply power to a machine or not, if you are supplying power to a machine but it isn't powered on, there is no way to turn it on
- I can get a serial console remotely in situations where SSH or telnet aren't available, such as managing the BIOS and the bootloader, without paying for an IP addressable KVM
- I can get remote serial console access when the OS has hung or kernel panicked, when a machine won't boot or shutdown, or when it goes into interactive fsck or maintenance mode at boot-time, without paying for an IP addressable KVM
- IP PDUs and IP KVMs are very expensive for a small business

# Versions of IPMI

There are currently 3 IPMI revisions:

- IPMI v1.0 - Autonomous access, logging and control. IPMI messaging command sets, sensor data records and event messages. Access through system interfaces like memory mapped IO, I2C bus etc
- IPMI v1.5 - Ability to send IPMI messages to BMC over LAN, LAN alerting. SOL using non-standard proprietary methods
- IPMI v2.0 - Serial Over LAN standardised, enabling console redirection, access control, enhanced authentication, packet encryption using RCMP+ instead of RCMP, SMBus interface
- SOL allows you to manage the server as though it were local when the OS locks up and SSH or telnet access are not available. IPMI v1.5 still allows you to remotely power the system on and off and view sensor output

# Configuring IPMI

Of course you need a BMC first...

- You need to configure your BMC with it's own unique IP address, this can be in the BIOS, using the manufacturers tools, or in the OS after installing the right tool
- On your server you need to install OpenIPMI (aka openipmi in Debian derivs) and ipmitool (aka OpenIPMI-tools in RH/Fedora)
- On your network management node you need to install ipmitool (aka OpenIPMI-tools)
- You need to tell your OS to load the drivers, either manually, using `/etc/modules` (Debian derivs), or `chkconfig ipmi on;`  
`service ipmi start` (in RH/Fedora)

# Configuring IPMI

## Getting a SOL console:

- Tell your BIOS to redirect a 19.2Kb vt100 console over com1
- Some BMCs can do different speeds, but 19.2Kb is a default
- Tell grub to run a similar console over ttyS1 (aka com1):
  - `kernel /vmlinuz-2.6.22-14-amd64-server root=/dev/sda2 ro console=tty0 console=ttyS1,19200n8r`
  - Disable rhgb, splash image and hidden menu in Grub
- Tell init to do the same:
  - (Deb) `s1:2345:respawn:/sbin/getty -L ttyS1 19200 vt100`
  - (RH) `s1:2345:respawn:/sbin/agetty -h ttyS1 19200 vt100`
- Fedora seems to the above step for me recently
- Reboot and you're good to go



# Basic IPMI Commands

- `ipmitool` syntax is similar to Cisco IOS
- For each command sent without options, it will provide you with a list of subcommands
- Basic command, run locally, as root:
- `ipmitool <command>`
- Such as:
- `ipmitool chassis power status`

**Chassis Power is on**

- Try it without any commands at first to get a list of options and then build up your subcommands as you go

# Controlling Remote Machines

- Using IPMI to Control Remote Machines
- Example command:
- `ipmitool -I lan -H 192.168.10.15 -U admin -a chassis power status`
- `-I lan` means we're talking to a BMC lan interface
- `-H` is the host IP or resolvable hostname
- `-U` is the BMC username
- `-a` means we will supply the password at a prompt
- the last part is the command itself

# Other Useful Commands

- `chassis power off` (an immediate hard power off)
- `chassis power on`
- `chassis power reboot` (combination of off and then on)
- `chassis power reset` (like pressing reset switch)
- `chassis status` (sensor readings etc)
- `lan print 1` (prints the lan settings)
- `lan set 1 <subcommand>` (configures lan settings)
- BMCs have more than one channel, 1 is normally the LAN interface

# Further Configuration

- Some Supermicro BMCs arp gratuitously which degrades network performance, so turn it off:
- `ipmitool lan set 1 arp generate off`
- Set the BMC's netmask as well as it's default and backup gateways:
- `ipmitool lan set 1 netmask 255.255.255.0`
- `ipmitool lan set 1 defgw ipaddr 192.168.1.1`
- `ipmitool lan set 1 bakgw ipaddr 192.168.1.254`
- You can also set the gateway MAC addresses if you want to.
- Set it's SNMP community name so that we can send SNMP traps:
- `ipmitool lan set 1 snmp <community name>`
- Supermicro also provide a Graceful Shutdown daemon for Linux, but I haven't played with that

# Using SOL to Get a Remote Console

- All the magic is in the BIOS and the BMC, it should just work if you did the BIOS, bootloader and init configuration
- You just need an IPMI SOL application, like Supermicro's IPMIView, I haven't used or heard of any others.
- IPMIView is a Java Swing app for Windows and Linux
- IPMIView Screenshots (no window borders for single window screenshots under Compiz-Fusion apparently)...

# Supermicro IPMIView

## Screenshots... Search for Devices

Network IP From

To

Network Mask

Search Option

IPMI 2.0  IPMI 1.5

Found:1

IP	Name	Version
192.168.1....	192.168.1....	IPMI 2.0+ (SIM IPMI)

# Supermicro IPMIView Screenshots... Login

The screenshot displays the Supermicro IPMIView interface. At the top, there is a menu bar with 'File', 'Edit', 'Session', 'Manage', and 'Help'. Below the menu is a toolbar with icons for file operations and session management. The main window is titled '192.168.1.15' and contains a central login form. The form displays system information: System Name: 192.168.1.15, IP Address: 192.168.1.15, and Description: 192.168.1.15. Below this, there are input fields for 'Login ID' (containing 'admin') and 'Password' (containing '\*\*\*\*\*'). A checkbox labeled 'save ID and Password' is present. Two buttons, 'Login' and 'Logout', are located below the password field. A large 'CONNECTED' status indicator is centered on the screen. At the bottom, there is a navigation bar with tabs for 'Login', 'Event Log', 'Sensors', 'IPM Device', 'BMC Setting', 'Users', 'Text Console', and 'Virtual Media'. A status bar at the very bottom indicates 'RMCP+ Open Session successful'.

File Edit Session Manage Help

SUPERMICRO

192.168.1.15

IPMI Domain

192.168.1.15

System Name 192.168.1.15

IP Address 192.168.1.15

Description 192.168.1.15

Login ID admin

Password \*\*\*\*\*

save ID and Password

Login Logout

**CONNECTED**

Version : IPMI 2.0 RMCP+

Cipher Suite : RAKP-HMAC-SHA1, HMAC-SHA1-96, AES-CBC-128

Login Event Log Sensors IPM Device BMC Setting Users Text Console Virtual Media

RMCP+ Open Session successful

# Supermicro IPMIView Screenshots... Sensors

The screenshot displays the Supermicro IPMIView software interface. The main window shows the IPMI Domain for 192.168.1.15. The interface is divided into several sections:

- Fans:** Two gauges showing Fan1 at 4300 RPM and Fan2 at 4400 RPM.
- Temperatures:** Three gauges showing CPU Temp 1 at 23.0C / 73F, CPU Temp 2 at 29.0C / 84F, and Sys Temp at 47.0C / 117F.
- Voltages:** Six gauges showing CPU1 Vcore (1.08V), CPU2 Vcore (1.08V), 3.3V (2.96V), 5V (4.48V), 12V (10.75V), and -12V (-13.2V). A separate VBAT gauge shows 2.96V.
- Sensors:** A small window showing two server rack icons.

At the bottom, there are controls for refreshing sensors (60 seconds), saving the layout, and checkboxes for "Hide inactive item" and "Show History". The bottom navigation bar includes: Login, Event Log, Sensors, IPM Device, BMC Setting, Users, Text Console, and Virtual Media.

Refreshing sensors' status completed



# Supermicro IPMIView Screenshots... Device Control

The screenshot displays the Supermicro IPMIView web interface. At the top, there is a menu bar with 'File', 'Edit', 'Session', 'Manage', and 'Help'. Below the menu is a toolbar with icons for file operations, search, and user management. The main content area is titled '192.168.1.15' and contains several sections:

- Device Information:** Shows 'Firmware Revision 01.29' and 'IPMI Revision 2.0'. To the right, the 'ACPI System Power State' is 'S5/G2' with a power button icon and the text 'Off'.
- Graceful Power Control:** Contains a single button labeled 'Graceful Shutdown'.
- Chassis Power Control:** Contains four buttons: 'Power Down', 'Power Up', 'Power Cycle', and 'Reset'.
- BMC:** Contains a button labeled 'Cold Reset'.

At the bottom of the main content area is a 'Refresh' button. Below the main content area is a navigation bar with tabs: 'Login', 'Event Log', 'Sensors', 'IPM Device', 'BMC Setting', 'Users', 'Text Console', and 'Virtual Media'. On the left side, there is a sidebar with a tree view showing 'IPMI Domain' and '192.168.1.15'. At the bottom left, a status message reads 'Get ACPI Power State succeeded'.

# Supermicro IPMIView Screenshots... LAN and SNMP

The screenshot displays the Supermicro IPMIView interface. The top menu bar includes File, Edit, Session, Manage, and Help. The main window is titled '192.168.1.15' and shows the 'BMC LAN Configuration' section. The IP Address is set to 192.168.1.15, the LAN MAC is 00:30:48:44:21:1, and the Gateway IP is 192.168.1.1. The Subnet Mask is 255.255.255.0. A message indicates that the LAN MAC must be correct while updating. The SNMP section shows the Community set to 'wolves' and a table of SNMP Trap Receivers with five entries, all set to 0.0.0.0. The interface also includes a 'Refresh' button and a bottom navigation bar with options like Login, Event Log, Sensors, IPM Device, BMC Setting, Users, Text Console, and Virtual Media. The status bar at the bottom indicates 'Loading BMC Setting Information done'.

File Edit Session Manage Help

**SUPERMICRO**

IPMI Domain 192.168.1.15

192.168.1.15

BMC LAN Configuration

IP Address: 192.168.1.15 LAN MAC: 00:30:48:44:21:1 Update

Gateway IP: 192.168.1.1

Subnet Mask: 255.255.255.0 LAN MAC must be correct while update

SNMP

Community: wolves Update

SNMP Trap Receivers

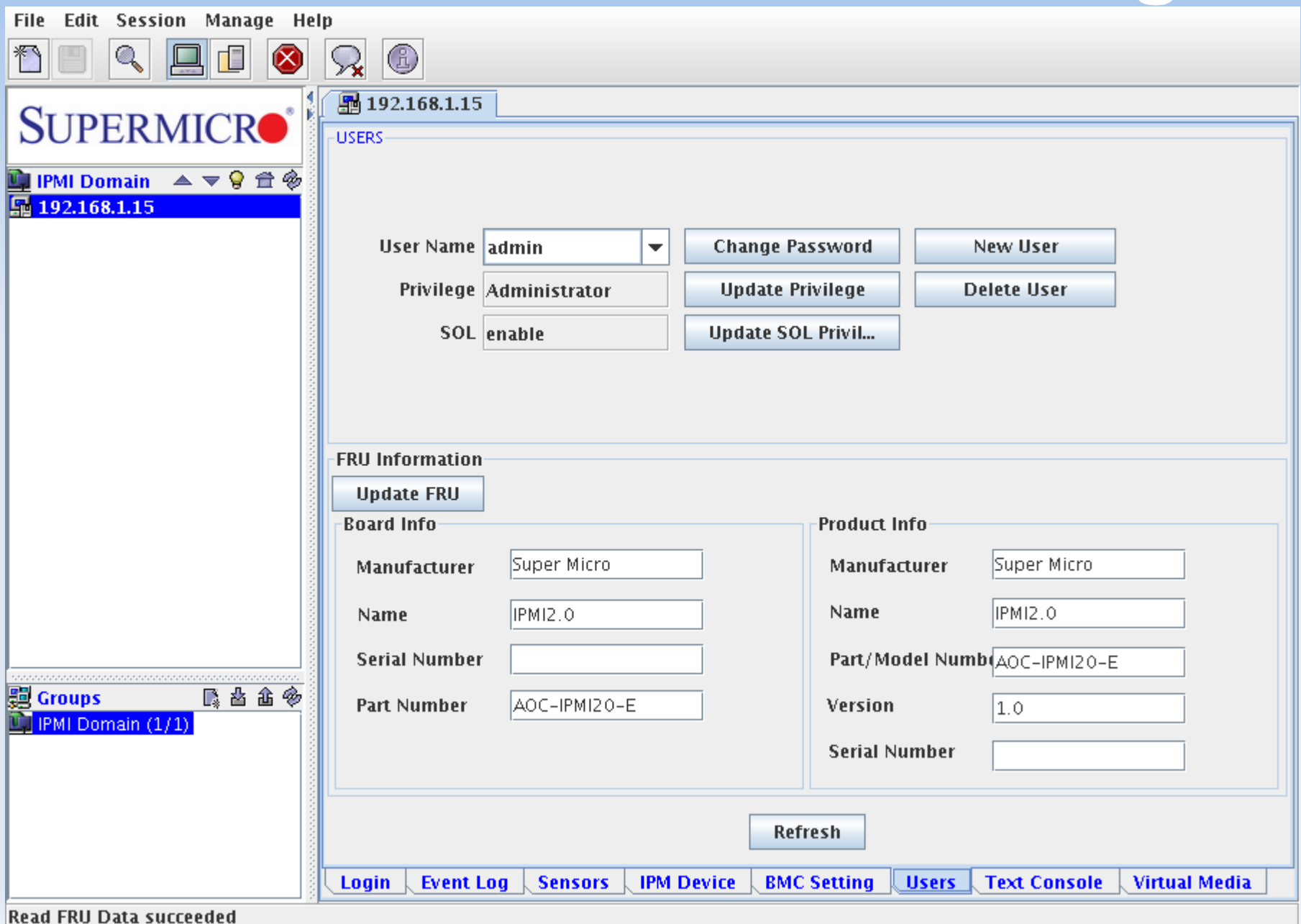
IP Address
0.0.0.0
0.0.0.0
0.0.0.0
0.0.0.0
0.0.0.0

Refresh

Login Event Log Sensors IPM Device **BMC Setting** Users Text Console Virtual Media

Loading BMC Setting Information done

# Supermicro IPMIView Screenshots... User Config



The screenshot displays the Supermicro IPMIView web interface for user configuration. The interface includes a menu bar (File, Edit, Session, Manage, Help), a toolbar, and a left-hand navigation pane. The main content area is titled 'USERS' and shows configuration for a user named 'admin'. Below this, there is an 'FRU Information' section with 'Board Info' and 'Product Info' sub-sections. A 'Refresh' button is located at the bottom of the FRU section. At the very bottom, a navigation bar contains links for Login, Event Log, Sensors, IPM Device, BMC Setting, Users (selected), Text Console, and Virtual Media. A status message at the bottom left reads 'Read FRU Data succeeded'.

**File Edit Session Manage Help**

**SUPERMICRO**

192.168.1.15

USERS

User Name:

Privilege:

SOL:

**FRU Information**

**Board Info**

Manufacturer:

Name:

Serial Number:

Part Number:

**Product Info**

Manufacturer:

Name:

Part/Model Number:

Version:

Serial Number:

**Groups**

IPMI Domain (1/1)

**Read FRU Data succeeded**

[Login](#) [Event Log](#) [Sensors](#) [IPM Device](#) [BMC Setting](#) [Users](#) [Text Console](#) [Virtual Media](#)

# Supermicro IPMIView Screenshots... SOL Console

The screenshot shows the Supermicro IPMIView application interface. The main window displays the SOL console for the IPMI Domain 192.168.1.15. The console output is as follows:

```
Fedora Core release 6 (Zod)
Kernel 2.6.22.9-61.fc6 on an x86_64

wolveslug login:
```

The interface includes a menu bar (File, Edit, Session, Manage, Help), a toolbar, and a sidebar with a tree view showing the IPMI Domain structure. The bottom of the window features a control panel with the following settings and buttons:

- Baud Rate (bps): 19200
- UTF-8
- RMCP+ Encryption
- Start
- Stop

At the bottom, there are tabs for: Login, Event Log, Sensors, IPM Device, BMC Setting, Users, Text Console, and Virtual Media. A status bar at the very bottom indicates "SOL Successful".

# Supermicro IPMIView Screenshots... Virtual Media

The screenshot displays the Supermicro IPMIView interface for configuring virtual media. The main window title is "192.168.1.15". The interface is divided into several sections:

- Virtual Media Status:** Shows two drives, Drive 1 and Drive 2, both currently "Empty".
- Floppy Image Upload:** Includes a "Drive:" dropdown menu set to "1", an "Open" button, and an "Upload" button. Below this is a text field for "Floppy Image file:".
- CD-ROM Image on Windows Share:** Includes a "Drive:" dropdown menu set to "1" and a "Set" button. Below this are five text input fields for "Share host:", "Share name:", "Path to image:", "User (optional...)", and "Password (optional):".

A message at the bottom of the main area states: "Drive Redirection not available: Not supported by Operating System".

At the bottom of the interface, there are three buttons: "Stop Drive 1", "Stop Drive 2", and "Refresh".

The bottom navigation bar contains the following tabs: "Login", "Event Log", "Sensors", "IPM Device", "BMC Setting", "Users", "Text Console", and "Virtual Media".

On the left side, there is a sidebar with a "SUPERMICRO" logo and a tree view showing "IPMI Domain" and "192.168.1.15". At the bottom of the sidebar, there is a "Groups" section showing "IPMI Domain (1/1)".

The top menu bar includes "File", "Edit", "Session", "Manage", and "Help".

At the very bottom of the window, a status bar reads: "Get Virtual Media information done".

# Negatives?

- Not always 100% reliable, I've had BMCs stop responding to LAN traffic and a BMC cold restart didn't work, I had to remove the power from the server and then bring it back up again
- SOL connections seem to lose characters or get some in the wrong order if you type too fast
- Both of the above might be Supermicro BMC or IPMIView implementation issues rather than IPMI itself
- Not all IPMI 2.0 BMCs support RCMP+ encrypted sessions, no prior IPMI versions do
- Not all BMCs can do speeds other than 19.2Kb/s
- SOL isn't a perfect environment, but it's better than travelling to your datacentre in an emergency

# Links

## Most Important first:

- [http://wiki.adamsweet.org/doku.php?id=ipmi\\_on\\_linux](http://wiki.adamsweet.org/doku.php?id=ipmi_on_linux)

## Others:

- <http://www.intel.com/design/servers/ipmi/>
- [http://en.wikipedia.org/wiki/Intelligent\\_Platform\\_Management\\_Interface](http://en.wikipedia.org/wiki/Intelligent_Platform_Management_Interface)