

1 Subject

Affected Products	conga-X7EVAL
Subject	Aspeed AST2500 Baseboard Management Controller (BMC)
Confidential/Public	Public
Date (yyyy-mm-dd)	2018-05-18
Author	CJR

2 Affected Article Numbers

2.1 Product Data

Affected Number(s)	Product
065420	conga-X7EVAL

3 BMC Information

The conga-X7EVAL evaluation carrier board features an Aspeed AST2500 baseboard management controller (BMC).

A BMC is a specialized microcontroller mainly used on server motherboards. The BMC is the key component for the IPMI (Intelligent Platform Management Interface) architecture. Its main task is to establish an interface between the system management software and the platform hardware.

The BMC can also perform tasks like:

- Error Logging
- Hardware Monitoring
- Power management and recovery control
- Remote management for logging, power control and console redirection

A BMC usually has its own IP address which can be accessed via an internet browser or a web GUI for remote control and debugging.

3.1 BMC on conga-X7EVAL

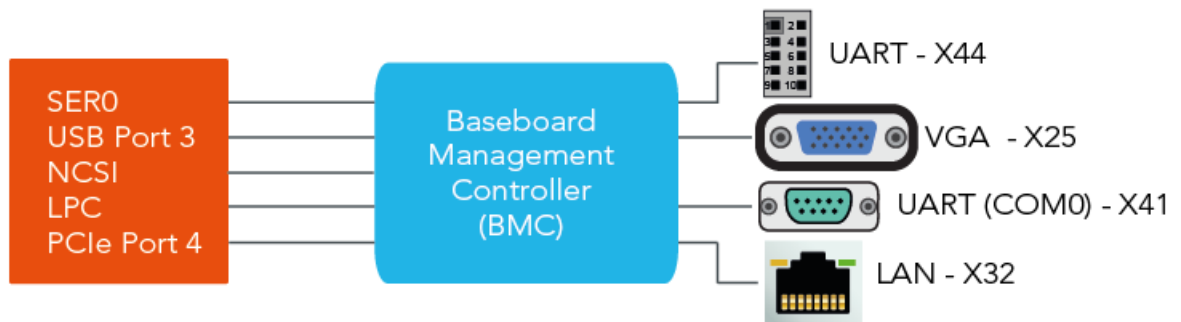
The BMC on the conga-X7EVAL is a proof-of-concept only. It can be used as a hardware design guide for carrier board designers and to test the physical interfaces of system firmware (BIOS) and remote system management software. The BMC functionality is highly application specific and not part of the COM Express Type 7 specification. The BMC firmware on the congatec Type 7 evaluation carrier board has a very limited feature set:

- VGA controller (built in AST2500 as PCIe endpoint)
- Super I/O UART
- IPMI system Interface
- Debug console for BMC
- webGUI for remote access (only shows AMI banner)



The BMC proof-of-concept implementation on conga-X7EVAL should not be used in customer end applications. congatec licensed the BMC firmware for the use on the evaluation carrier board only and is not allowed to redistribute this firmware/controller.

3.2 Block diagram of conga-X7EVAL BMC

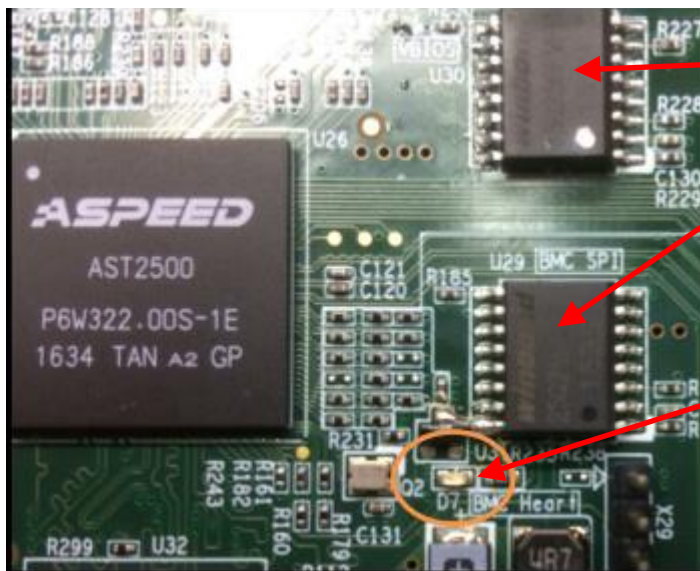


3.3 BMC solutions for customer end applications

System designers are responsible for the BMC implementation on their COM Express Type 7 carrier board. The implementation on the conga-X7EVAL can be used as a starting point for the hardware design. For a detailed design guide and for the firmware implementation, system designers should contact BMC solution providers like American Megatrends (AMI) or others. There is also an open source project for BMC solutions, called openBMC.

4 conga-X7EVAL BMC Demo

4.1 Verify the BMC Firmware is loaded and working



The Video BIOS is pre-programmed to U30 in production.

The BMC firmware (linux based) is pre-programmed to U29 in production.

The heart beat LED indicates if the BMC SPI flash is programmed.

Blink frequency 2 times per second: BMC working

Blink frequency very fast: BMC SPI flash not programmed or BMC firmware not functioning

4.2 VGA Output

The AST2500 BMC on conga-X7EVAL provides a simple 2D graphics controller solution connected to the PCI Express lane 4 which is shared with the PCIe x4 slot connector X24. Refer to chapter 4.1.5.1 in the conga-X7EVAL user's guide for more information.

COM Express Type 7 modules do not provide video output capability because most server and networking applications do not need it. On the other hand, a video output can be very helpful for board bring-up and system debugging. Having the VGA controller in the BMC can avoid the use of a discrete add-on video card.

The VGA controller is implemented in hardware and does not require BMC firmware support.



The Video BIOS must be flashed to the SPI flash U30.

4.3 Super I/O UART

BMCs usually provide a legacy UART interface for serial console redirection. The AST2500 BMC on conga-X7EVAL supports one UART routed via a RS232 transceiver to pin header X44. Refer to chapter 4.1.5.2 in the conga-X7EVAL user's guide for more information.

A BMC with UART(s) may be used instead of discrete Super I/O controllers on the carrier board. The System BIOS on the COM Express Type 7 module handles the UART(s) in the BMC like a discrete Super I/O chip connected to the LPC bus.

4.4 IPMI System Interface

For local access, IPMI defines several interfaces from the host to the BMC. This includes:

- Keyboard Controller Style (KCS)
- System Management Interface Chip (SMIC)
- Block Transfer (BT)
- SMBus System Interface (SSIF)

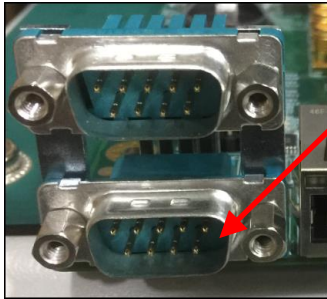
The BMC proof-of-concept solution on conga-X7EVAL supports KCS interfacing of the host/BIOS to the BMC. KCS defines a set of I/O mapped communication registers similar to the interface used for keyboard controller in PC architecture. Please refer to chapter 9 of the IPMI specification for more details.

The IPMI specification defines CA2h as the default I/O base address. This base address is valid for the BMC on conga-X7EVAL. All the communication between the System BIOS and BMC is handled via this KCS interface with the I/O base address CA2h.

4.5 BMC Debug Console

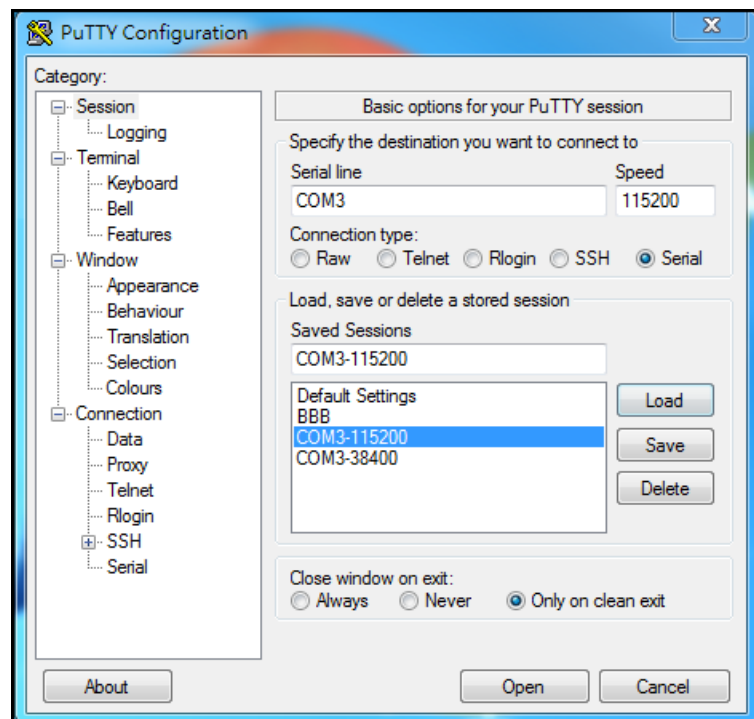
A dedicated BMC UART can be used as debug console when connected to a remote PC:

1. Set jumper X43 to positions 2-4 and 5-7. Refer to section 4.1.5.2 in the user's guide.
2. Connect a remote PC to the lower D-SUB9 Port with a null modem cable.



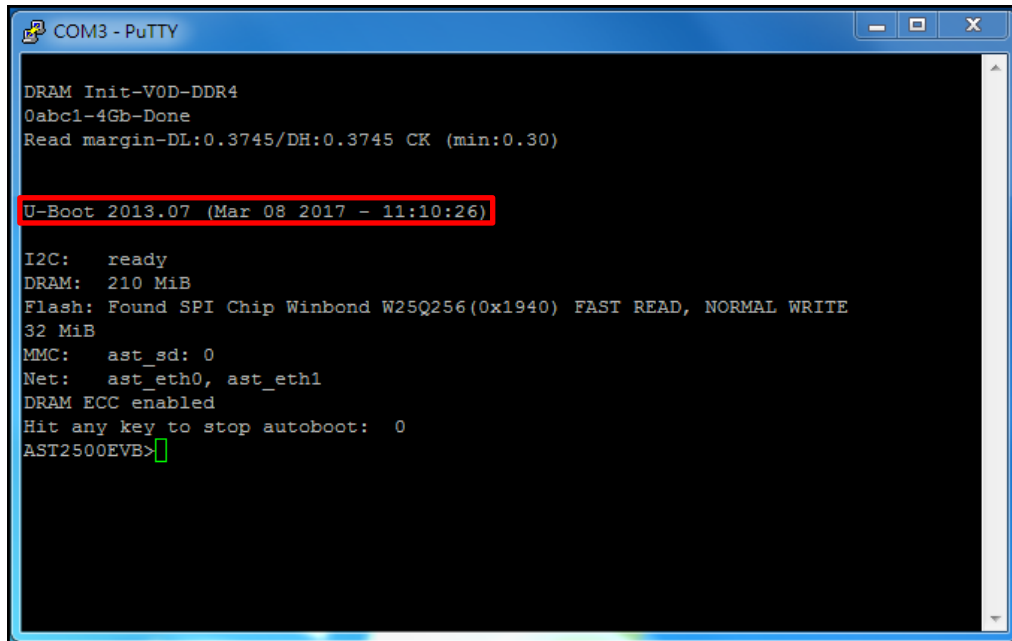
3. Run a terminal application (e.g. PuTTY or Tera Term) on the remote PC with the following UART parameters:

- 115200 Baud
- 8 data bits
- no parity
- one stop bit



4. Turn the power on and immediately press the "ESC" key on the remote PC.
5. The BMC will boot into U-boot.

- Verify that the U-Boot revision (as of April 2018) is 2013.07 (Mar 08 2017 – 11:10:26):

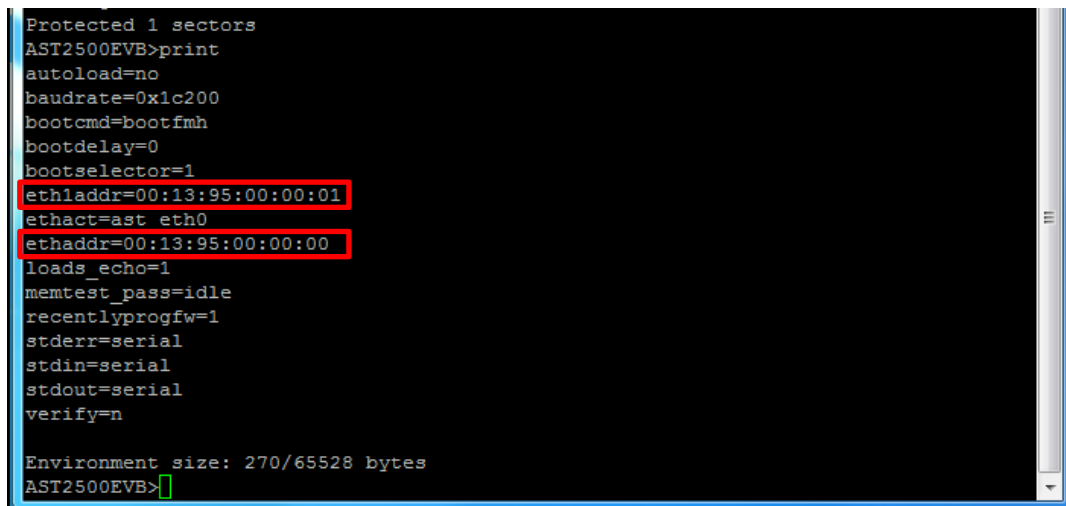


```

COM3 - PuTTY
DRAM Init-VOD-DDR4
0abc1-4Gb-Done
Read margin-DL:0.3745/DH:0.3745 CK (min:0.30)
U-Boot 2013.07 (Mar 08 2017 - 11:10:26)

I2C:   ready
DRAM:  210 MiB
Flash: Found SPI Chip Winbond W25Q256(0x1940) FAST READ, NORMAL WRITE
32 MiB
MMC:   ast_sd: 0
Net:   ast_eth0, ast_eth1
DRAM ECC enabled
Hit any key to stop autoboot:  0
AST2500EVB>
    
```

- Enter “print” to display the MAC addresses of the integrated Ethernet ports:



```

Protected 1 sectors
AST2500EVB>print
autoload=no
baudrate=0x1c200
bootcmd=bootfmh
bootdelay=0
bootselector=1
eth1addr=00:13:95:00:00:01
ethact=ast_eth0
ethaddr=00:13:95:00:00:00
loads_echo=1
memtest_pass=idle
recentlyprogfw=1
stderr=serial
stdin=serial
stdout=serial
verify=n

Environment size: 270/65528 bytes
AST2500EVB>
    
```

This U-boot debug environment can be used to set the MAC addresses of the two BMC Ethernet ports.

The Aspeed AST2500 BMC has two integrated MACs:

- MAC1 (eth0) is connected via the network controller sideband interface (NC-SI) to the COM Express Type 7 module. Therefore, the modules 10Gbe network can be used for remote management.
- MAC2 (eth1) connects to an onboard Gbe Phy and then to RJ45 connector X32. This port can be used for the remote access via WebGUI demo. See next chapter.

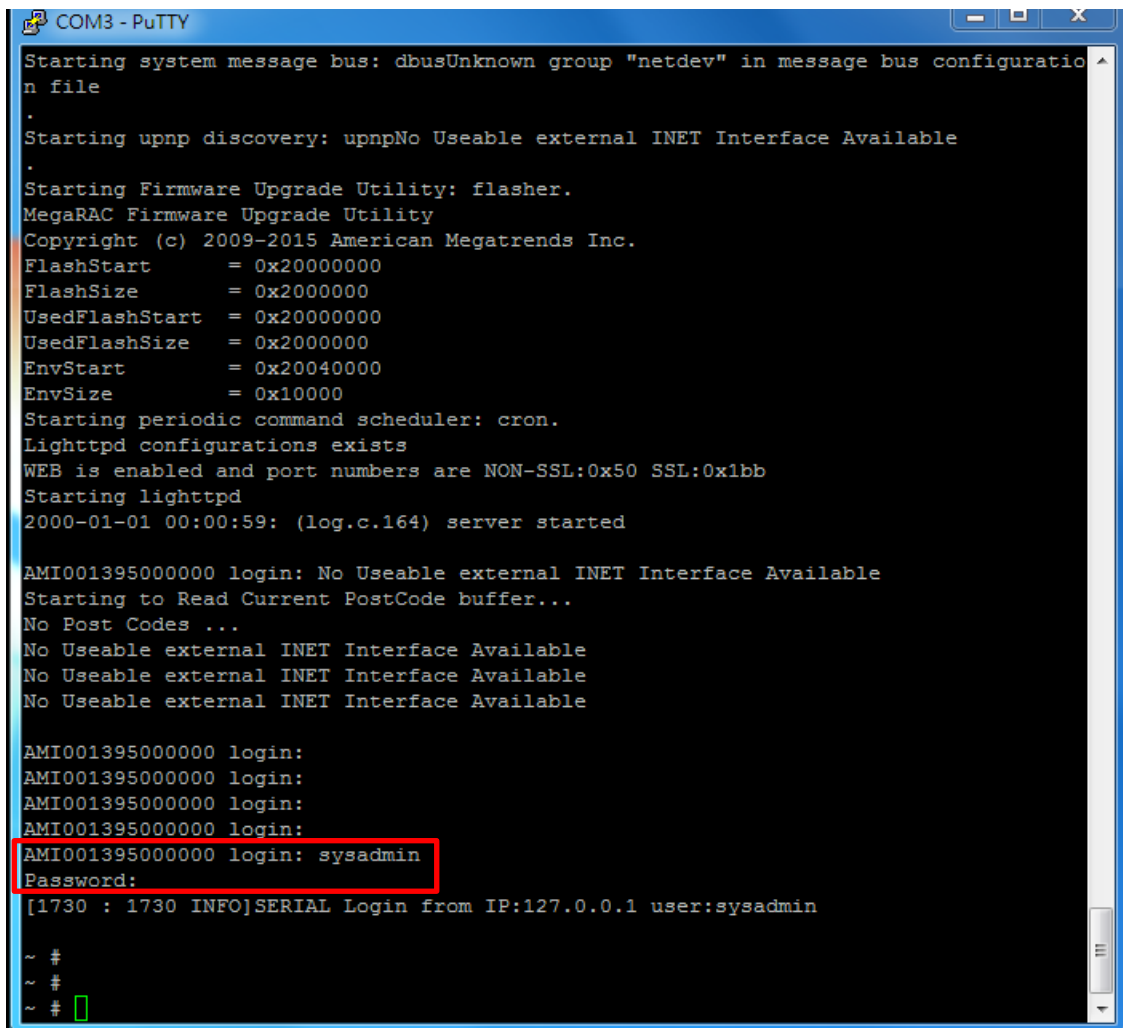
4.6 Remote Access with WebGUI

The BMC can provide remote access either via its UART from a local remote PC or via one of its two MACs from a remote PC in the network or internet.

In the example below, the MAC2 of the BMC is used to get access to the system via the network. To use the MAC1 via the NC-SI of the COM Express module, the module's NC-SI interface must be activated. It is not activated in the standard NVM configuration of the conga-B7XD's 10Gbe controller.

Get remote access to the BMC on conga-X7EVAL:

1. Follow steps 1-3 of the previous section 4.5 "BMC Debug Console".
2. Connect the BMC to the network via the RJ45 connector X32.
3. Turn the power on. DO NOT press "ESC".
4. The BMC will boot into its Linux environment and ask for login.
5. Login as "sysadmin" with password "superuser":



```

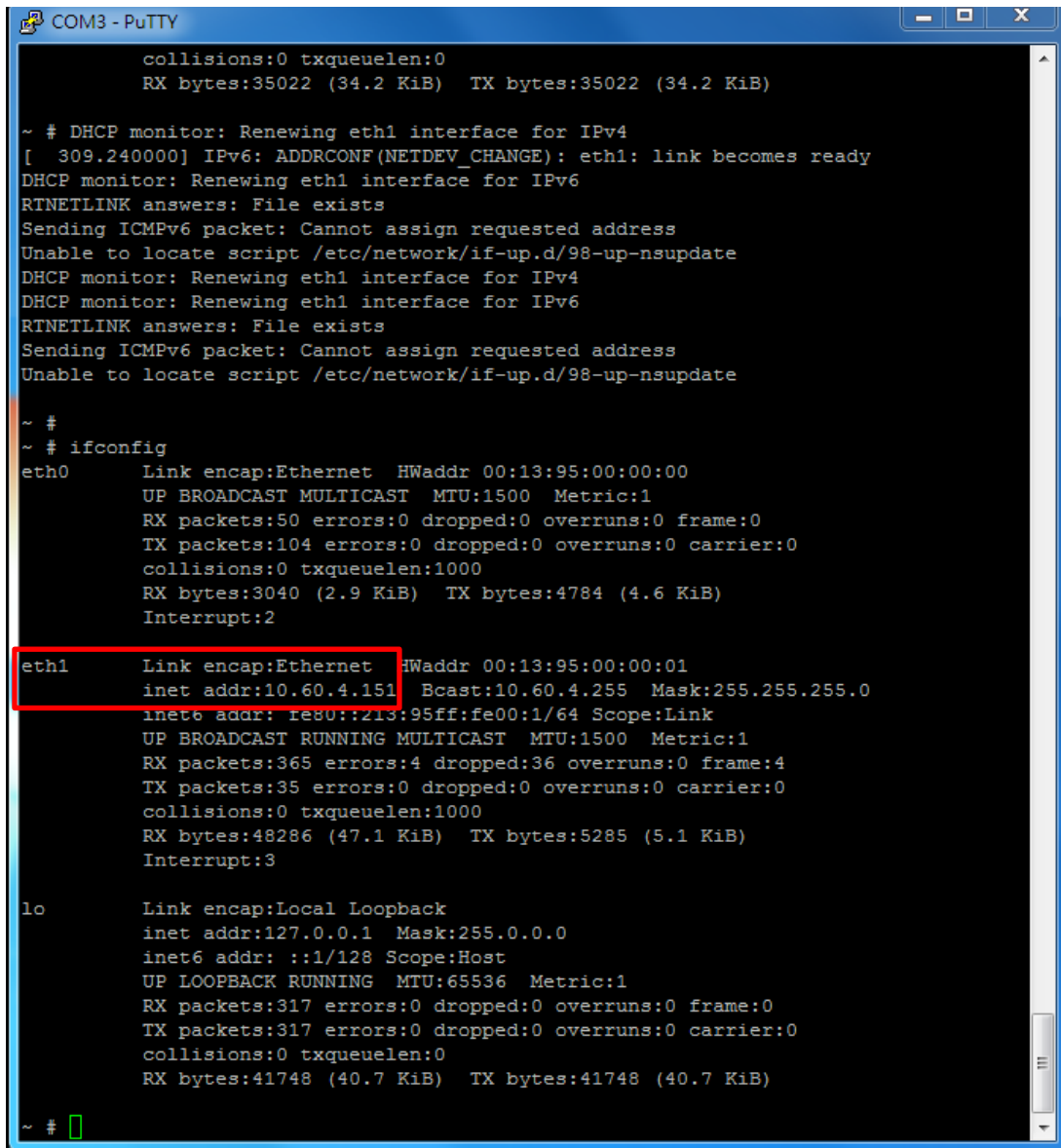
COM3 - PuTTY
Starting system message bus: dbusUnknown group "netdev" in message bus configuratio
n file
.
Starting upnp discovery: upnpNo Useable external INET Interface Available
.
Starting Firmware Upgrade Utility: flasher.
MegaRAC Firmware Upgrade Utility
Copyright (c) 2009-2015 American Megatrends Inc.
FlashStart      = 0x20000000
FlashSize       = 0x20000000
UsedFlashStart  = 0x20000000
UsedFlashSize   = 0x20000000
EnvStart        = 0x20040000
EnvSize         = 0x10000
Starting periodic command scheduler: cron.
Lighttpd configurations exists
WEB is enabled and port numbers are NON-SSL:0x50 SSL:0x1bb
Starting lighttpd
2000-01-01 00:00:59: (log.c.164) server started

AMI001395000000 login: No Useable external INET Interface Available
Starting to Read Current PostCode buffer...
No Post Codes ...
No Useable external INET Interface Available
No Useable external INET Interface Available
No Useable external INET Interface Available

AMI001395000000 login:
AMI001395000000 login:
AMI001395000000 login:
AMI001395000000 login:
AMI001395000000 login: sysadmin
Password:
[1730 : 1730 INFO]SERIAL Login from IP:127.0.0.1 user:sysadmin

~ #
~ #
~ #
  
```


6. Enter "ifconfig" to get the IP address of the BMCs eth1 interface:



```

collisions:0 txqueuelen:0
RX bytes:35022 (34.2 KiB) TX bytes:35022 (34.2 KiB)

~ # DHCP monitor: Renewing eth1 interface for IPv4
[ 309.240000] IPv6: ADDRCONF(NETDEV_CHANGE): eth1: link becomes ready
DHCP monitor: Renewing eth1 interface for IPv6
RTNETLINK answers: File exists
Sending ICMPv6 packet: Cannot assign requested address
Unable to locate script /etc/network/if-up.d/98-up-nsupdate
DHCP monitor: Renewing eth1 interface for IPv4
DHCP monitor: Renewing eth1 interface for IPv6
RTNETLINK answers: File exists
Sending ICMPv6 packet: Cannot assign requested address
Unable to locate script /etc/network/if-up.d/98-up-nsupdate

~ #
~ # ifconfig
eth0    Link encap:Ethernet  HWaddr 00:13:95:00:00:00
        UP BROADCAST MULTICAST  MTU:1500  Metric:1
        RX packets:50 errors:0 dropped:0 overruns:0 frame:0
        TX packets:104 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:3040 (2.9 KiB) TX bytes:4784 (4.6 KiB)
        Interrupt:2

eth1    Link encap:Ethernet  HWaddr 00:13:95:00:00:01
        inet addr:10.60.4.151  Bcast:10.60.4.255  Mask:255.255.255.0
        inet6 addr: fe80::213:95ff:fe00:1/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:365 errors:4 dropped:36 overruns:0 frame:4
        TX packets:35 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:48286 (47.1 KiB) TX bytes:5285 (5.1 KiB)
        Interrupt:3

lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:317 errors:0 dropped:0 overruns:0 frame:0
        TX packets:317 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:41748 (40.7 KiB) TX bytes:41748 (40.7 KiB)

~ # █
    
```

7. Enter this IP address (In this example: <https://10.60.4.151>) into a browser of a remote PC. Ensure the remote PC is in the same network domain. Now, you have remote access to the BMC on the conga-X7EVAL.



Note

The BMC firmware of the conga-X7EVAL is limited and therefore you will only see a blank page with the AMI banner.

5 Useful Links

IPMI Specification 2.0:

- www.intel.com/design/servers/ipmi/index.htm

Wikipedia:

- <http://en.wikipedia.org/wiki/Ipmi>

Intel IPMI Technical Resources Website:

- <https://www.intel.com/content/www/us/en/servers/ipmi/ipmi-technical-resources.html>

6 Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2018-05-18	CJR	First release of the document.
