1 Subject

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<th>Affected Products</th>
<th>conga-X7EVAL</th>
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<td>Subject</td>
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<tr>
<td>Confidential/Public</td>
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</tr>
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<td>Date (yyyy-mm-dd)</td>
<td>2018-05-18</td>
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<td>Author</td>
<td>CJR</td>
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2 Affected Article Numbers

2.1 Product Data

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<td>065420</td>
<td>conga-X7EVAL</td>
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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)

Note

*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.

*Note*

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

   ![U-Boot Debug Environment](image1.png)

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

   ![MAC Addresses](image2.png)

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-B7XDs 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”:

![Remote Access with WebGUI](image-url)
6. Enter “ifconfig” to get the IP address of the BMCs eth1 interface:

```
$ ifconfig
```

![Image showing ifconfig command output]

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:

Intel IPMI Technical Resources Website:

6 Revision History

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<td>1.0</td>
<td>2018-05-18</td>
<td>CJR</td>
<td>First release of the document.</td>
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