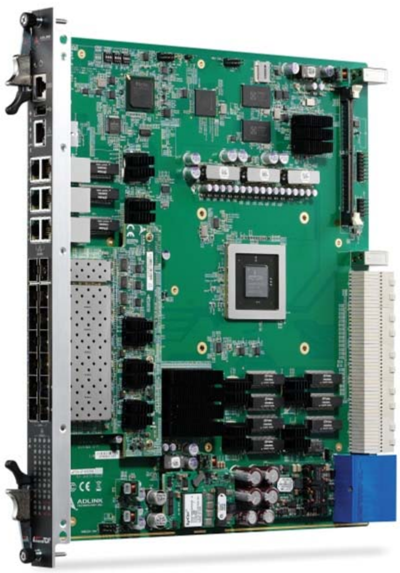
aTCA-3430

10GbE AdvancedTCA
Fabric Interface Switch

User's Manual



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Advance Technologies; Automate the World.

Revision History

Rev	Date	Description
0.10	2014/12/27	Preliminary release
0.20	2014/12/30	Update switch info, 10GbE port switching diagram

Preface

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Abbreviations

Term	Description
ASIC	Application Specific Integrated Circuit
ATCA	Advanced Telecom Computing Architecture
Base Interface	ATCA Base Interface on Zone-2 connectors to connect to the dual hubs, 4 differential pairs per Base Channel.
Blade	A printed circuit board assembly that plugs into a chassis
BSP	Board Support Package
Boot-flash	Flash memory where the bootloader program is stored
Bootloader	Code used to boot the System before loading OS
DDR	Double Data Rate DRAM memory
DFT/DFM	Design For Test/Manufacturing
DIMM	Dual Inline Memory Module
ECC	Error Correction Control
E-keying	Standard defined by PICMG useful to verify whether the ATCA blade plugged in is compliant to the fabric link capabilities
Fabric Interface	ATCA Fabric Interface on the Zone-2 connectors to connect to the dual Switch Fabric Blades
Fabric Slot	A slot supporting a link connection to/from each node slot
FRU	Field Replaceable Unit
GPIO	General Purpose Input/Output
Hot-swap	Functions of replacing system components without shutting down the system
IPMB	Intelligent Platform Management Bus
IPMB-L	IPMB Local interface
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
JTAG	Joint Test Action Group
MAC	Media Access Controller
MMC	Module Management Controller
NPU	Network Processor Unit
OOS	Out Of Service
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect-Express
PHY	Physical Layer or Physical Layer Device
PICMG	PCI Industrial Computer Manufacturers Group
RGMII	Reduced Gigabit Medium Independent Interface
RTM	Rear Transition Module
RXAUI	Reduced XAUI, having 2 lanes@6.25Gbps
SDR	Sensor Data Record
SDRAM	Synchronous Dynamic Random Access Memory
SFP	Small Form Pluggable (1G interface)
SFP+	Small Form Pluggable Plus (10G interface)

Term	Description
SGMII	Serial Gigabit Medium Independent Interface
SOL	Serial Over LAN
QSFP+	Quad Small Form Pluggable Plus (40G interface)
UART	Universal Asynchronous Receiver-Transmitter
VLP	Very Low Profile, DRAM Module Form Factor Spec
XAUI	10 Gigabit (X) Attachment Unit Interface, having 4 lanes@3.125Gbps
XLAUI	40 Gigabit (XL) Attachment Unit Interface

1. Overview

1.1 Introduction

The aTCA-3430 is a high performance 10G Fabric switch blade for AdvancedTCA® platforms. This product is ideal for bandwidth intensive telecom applications such as wireless access controllers, DPI/security network, IPTV, IP multimedia subsystems, RNC/BSC, broadband access/bearer networks, data centers, and LTE/4G network applications. The aTCA-3430 provides 10GbE hub-to-node connectivity and integrated switch silicon that supports load balancing, priority queues, packet classification, and flow control to enable strict bandwidth management for implemented applications.

In addition to a Fabric switch, the aTCA-3430 also incorporates a Base switch to provide PICMG 3.0 Gigabit Ethernet backplane connectivity. The Base switch provides up to 13 ports of node slot connectivity to support both 6 and 14-slot chassis in addition to 8 ports of front I/O, with 6 ports supporting 1GbE and 2 ports supporting 10GbE. Other ports are used to provide connectivity to other components on the board such as the Local Management Processor (LMP) and Intelligent Platform Management Controller (IPMC), and a redundant switch slot supports connectivity with the redundant Base switch and shelf management. A powerful quad-core LMP executes all switch functions, blade setup and hardware platform management functions. Dual boot flash memory is provided for redundancy and a microSD card is provided for OS storage.

The ADLINK aTCA-3430 is equipped with the ADLINK PacketManager software package, which combines all the essential features required for a fully functional switch infrastructure on ATCA platforms. This complete package allows customers to focus on revenue-generating software development projects and provides the flexibility to develop specific functions according to customer requirements.

1.2 Functional Block Diagram

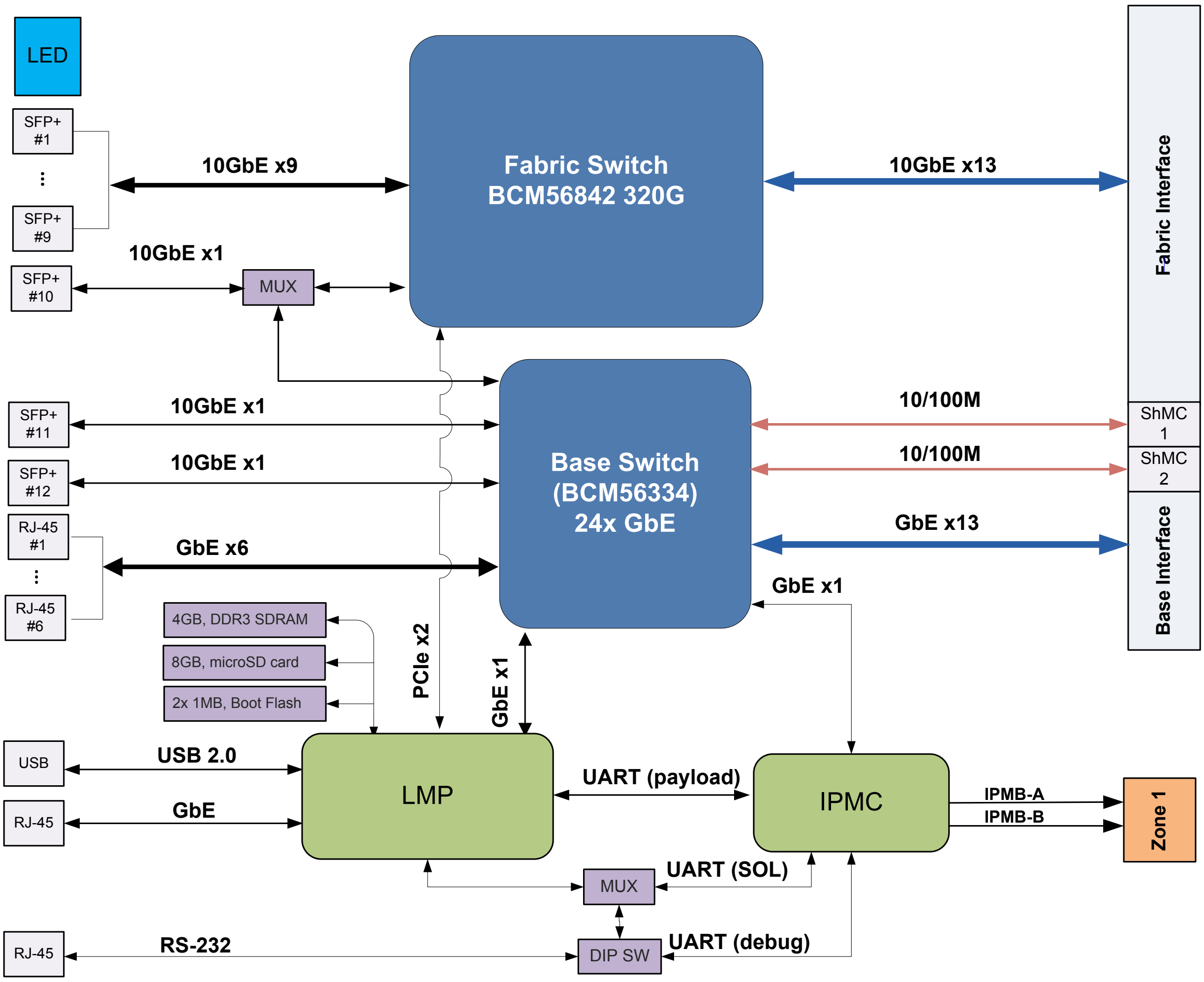


Figure 1. aTCA-3430 Block Diagram

1.3 Package Contents

The aTCA-3430 is shipped with the components listed below. If any of the items in the contents list are missing or damaged, retain the shipping carton and packing material and contact the dealer for inspection. Please obtain authorization before returning any product to ADLINK.

The packing contents of non-standard configurations may vary depending on customer requests.

- aTCA-3430 AdvancedTCA Switch Blade

2. Features and Specifications

Feature	Function	Description
Dimensions		322.25mm x 280mm x 6HP (L x W x H), AdvancedTCA single slot
LMP Subsystem	Processor	Freescale QorIQ P2040(Quad Core) @ 1.0GHz
	DRAM Memory	4GB DDR3 1333 Mini-RDIMM 1Rx8 VLP (512Mx8)
	Boot Flash Memory	2x 8 Mbit SPI serial flash, redundant
	OS Flash Memory	8GB industrial grade microSD card
Data Interconnection	Ethernet Switching	BCM56842 320Gbps bandwidth 10GbE switch fabric with QoS support
I/O Interface	10GB Interface	12 x SFP+, 10 ports from Fabric switch, 2 ports from Base switch
	1GB Interface	6 x RJ-45
	10/100/1000BASE-T Management	One RJ-45 from LMP
	Serial Console (UART)	One RJ-45 serial port connects to either LMP or IPMC
	USB	One USB 2.0 port
	Reset Button	Recessed push button for blade reset
Backplane Connection	Base Interface	Zone 2, supporting 13 ports 1000BASE-T Ethernet & 2 ports 10/100BASE-T Ethernet to ShMC, dual star
	Fabric Interface	Zone 2, PICMG 3.1 Rev 2.0 Fabric Interface switching – Option1, 9, 9-K (10GBASE-KX4), 1-KR (one 10GBASE-KR)
	Power Interface	Zone 1, -48VDC
Power Consumption		100W max.
Environmental and Reliability	Temperature	Operating: +0°C to 50°C Non-operating: -40°C to 70°C
	Relative Humidity	5 - 95%, non-condensing
	Shock	Non-operating: 20G peak-to-peak, 11ms duration
	Vibration	Operating: 0.5Grms 5-500Hz each axis Non-operating: 1.88Grms, 5-500Hz each axis
Software	Bootloader	U-Boot (LMP)
	BSP	ADLINK BSP (LMP)
	Operating System	Open Linux OS
	Development Environment	Broadcom SDK running under Open Linux on LMP
	ADLINK Shelf Management in IPMI package	• HW management per ATCA PICMG 3.0; includes IPMI management, FRU HW management, shelf environment management (power, cooling, watchdog timer, E-keying), and shelf sensor management • IPMI over LAN (RMCP/IP) and Serial-Over-LAN per PICMG 3.0
	ADLINK PacketManager Software	• Full featured CLI/Telnet for controlling all switch features • L2/L3 packet processing • Load balancing based on L2, L3, L4 switching protocol, routing etc. • ACLs up to 7-tuple matching Layer 2-4 fields • IP packet forwarding of IPv4, IPv6 and IP multicast • VLAN, STP, link aggregation etc. • Additional protocols are available upon request

Table 1: aTCA-3430 Specifications

3. External Interfaces

3.1 Front Panel

The face plate of the main blade has the following components:

- LED-OOS: Out Of Service indicator
- LED-Power Good: Power indicator
- LED-Health: Health indicator
- LED-HS: Hot-Swap indicator
- LED-Fabric Interface: Fabric Interface Link & Activity indicator
- LED-Base Interface: Base Interface Link & Activity indicator
- LED-Mgmt Link/Act: Management Port Link/ACT indicator
- LED-Mgmt Speed: Management Port Speed indicator
- LED-Service Ports Enable/Act: Service Port indicator
- Console Port: Serial port to LMP or IPMC
- USB Port: Connected to LMP
- Management Ethernet Port: 10/100/1000BASE-T
- Reset Button: System reset switch (recessed)
- Service Ports #1~#12: SFP+ ports for data plane interface
- Service Ports#1~#6: RJ-45 ports for data plane interface

3.2 Front Panel

3.2.1 Serial Console Port

One serial console port is provided via an RJ-45 shielded connector outlet, and is connected to the LMP, which enables access to all major devices using command line interface commands for configuration and monitoring. This port is also configured to be shared with the IPMC. Serial port configuration is RS-232 compatible including XON/XOFF, baud rate, stop, and start bit setting. The label for the serial console port is noticeably different from the management Ethernet port to avoid ambiguity as they are both RJ-45 connectors (the console port has no LEDs) . The pin-out of the serial interface RJ-45 connector is compatible to the Cisco serial port pinout as shown in Table 2, and the configuration values are shown in Table 3.

Pin	Description
1	RTS
2	NC
3	TXD
4	GND
5	GND
6	RXD
7	NC
8	CTS

Table 2. Serial Console Port Pinout

Item	Value
Baud rate	115200
Data	8-bit
Parity	None
Stop bit	1-bit
Flow control	None

Table 3. Serial Console Port Configuration Values

3.2.2 USB Port

A single USB port is available on the face plate, which is connected to the LMP. The P2040 supports 2x USB compliant to USB specification Rev 2.0. On the board, USB2 is routed to the faceplate USB connector. USB1 is not used.

3.2.3 Management Ethernet Port

Seven RJ-45 Ethernet ports are provided on the front panel. One 10/100/1000BASE-T port is connected directly to the LMP for easy debugging/testing (such as a simple connection to a different subnet console by configuring an IP address for the port without involvement of the blade switch). The label for the management Ethernet port is noticeably different from the serial conole port to avoid ambiguity as they are both RJ-45 connectors (the management Ethernet port has Link/Act LEDs)

Pin #	1000BASE-T
1	BI_DA+
2	BI_DA-
3	BI_DB+
4	BI_DB-
5	BI_DC+
6	BI_DC-
7	BI_DD+
8	BI_DD-

Table 4. RJ-45 Management Port Pinout

3.2.4 Service Ports

Traffic service ports are provided with RJ-45 and SFP+ outlets. Either a fiber optic cable or a copper cable with a mating SFP+ connector can be used to connect the blade with remote blades or appliances. The SFP+ ports support IEEE 802.3ae (Clause 52) and IEEE 802.3aq (Clause 68).

3.2.5 Reset Switch

The front panel reset switch is a global reset switch for the blade. When pushed, a payload reset event is sent to the IPMC to begin corresponding initialization procedures.

3.2.6 LEDs and Markers

Various LEDs for system status monitoring are available from the faceplate. Shown in Table 5 are the LEDs and their descriptions.

Name	Marker	Display	Description
HS LED		Blue Solid	DC-DC Power OFF(M1)
		Blue Short Blink	Hot swap Operation(M5/M6)
		Blue Long Blink	Hot swap Operation(M2)
		OFF	Normal Operation(M3/M4)
OOS LED		Red Solid	Out of Service(M1)
		Red Blink	Out of Service or Service Preparation (M5/M6)
		OFF	Normal Operation(M3/M4)
Power Good LED		Green Solid	Power GOOD
		OFF	Power Fail
Health LED	APP	Amber Solid	Health Check
		OFF	Normal Operation
Mgmt Link/Act LED	(MGMT)	Green Solid	MGMT Link ON
		Green Blink	MGMT Link ON & Activity
		OFF	MGMT Link OFF
Mgmt Speed LED	(MGMT)	Yellow Solid	1G speed Indicator
		OFF	10/100Mbps Speed Indicator
Base Service Port LED	(BASE)	Green Solid/Blink	Link ON & Activity
		OFF	Link OFF
		Yellow Solid	1G speed Indicator
		OFF	10/100Mbps Speed Indicator
Fabric Service Port LED	**E**	Green Solid	1G or 10G Link ON
		OFF	Link OFF
	L/A	Green Blink	1G or 10G Activity
		OFF	No Activity

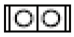
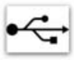
Name	Marker	Display	Description
Console Port		N/A	Section 3.1.1
USB Port		N/A	Section 3.1.2
MGMT Port	 (MGMT)	N/A	Section 3.1.3

Table 5. Front Panel LEDs and Markers

3.3 Zone 2 Backplane Interfaces

ATCA specifications define Zone 2 for Fabric, Base and update channel interface interconnections. The Base Interface port is compliant to 1000BASE-T Ethernet. Thirteen Base Interface ports from the backplane are connected to the Ethernet switch in the blade. Through the switch, the Base Interface traffic goes to the LMP for necessary processing. The Fabric Interface on the aTCA-3430 blade can connect to up to thirteen boards in the chassis. The thirteen Fabric Interface ports are connected to the high capacity onboard Ethernet switch, where the port speed is configurable to 1Gbps/10Gbps in the form of 4 SerDes lanes at 2.5Gbps each or 1 SerDes lanes at 10Gbps, each compliant with Option 1/9, 10GBase-KX4 or 10GBase-KR respectively.

4. Getting Started

The aTCA-3430 has been designed for easy installation. However, the following standard precautions, installation procedures, and general information must be observed to ensure proper installation and to preclude damage to the board, other system components, or injury to personnel.

4.1 Safety Requirements

The following safety precautions must be observed when installing or operating the aTCA-3430. ADLINK assumes no responsibility for any damage resulting from failure to comply with these requirements.

Do not touch the heatsink when installing or removing the board. The board should not be placed on any surface or in any form of storage container until the board and heat sink have cooled down to room temperature.

This ATCA blade contains electrostatic sensitive devices. Please observe the necessary precautions to avoid damage to your board:

- Discharge your clothing before touching the assembly. Tools must be discharged before use.
- Do not touch components, connector-pins or traces.
- If working at an anti-static workbench with professional discharging equipment, please do not omit to use it.

4.2 Quick Start

4.2.1 Hardware Configuration Setting

For normal operation, it is not recommended to change any onboard hardware configuration settings, but there are some options on the board for those want to investigate more flexibility for testing. Figure 2 illustrates the locations of the configurable components.

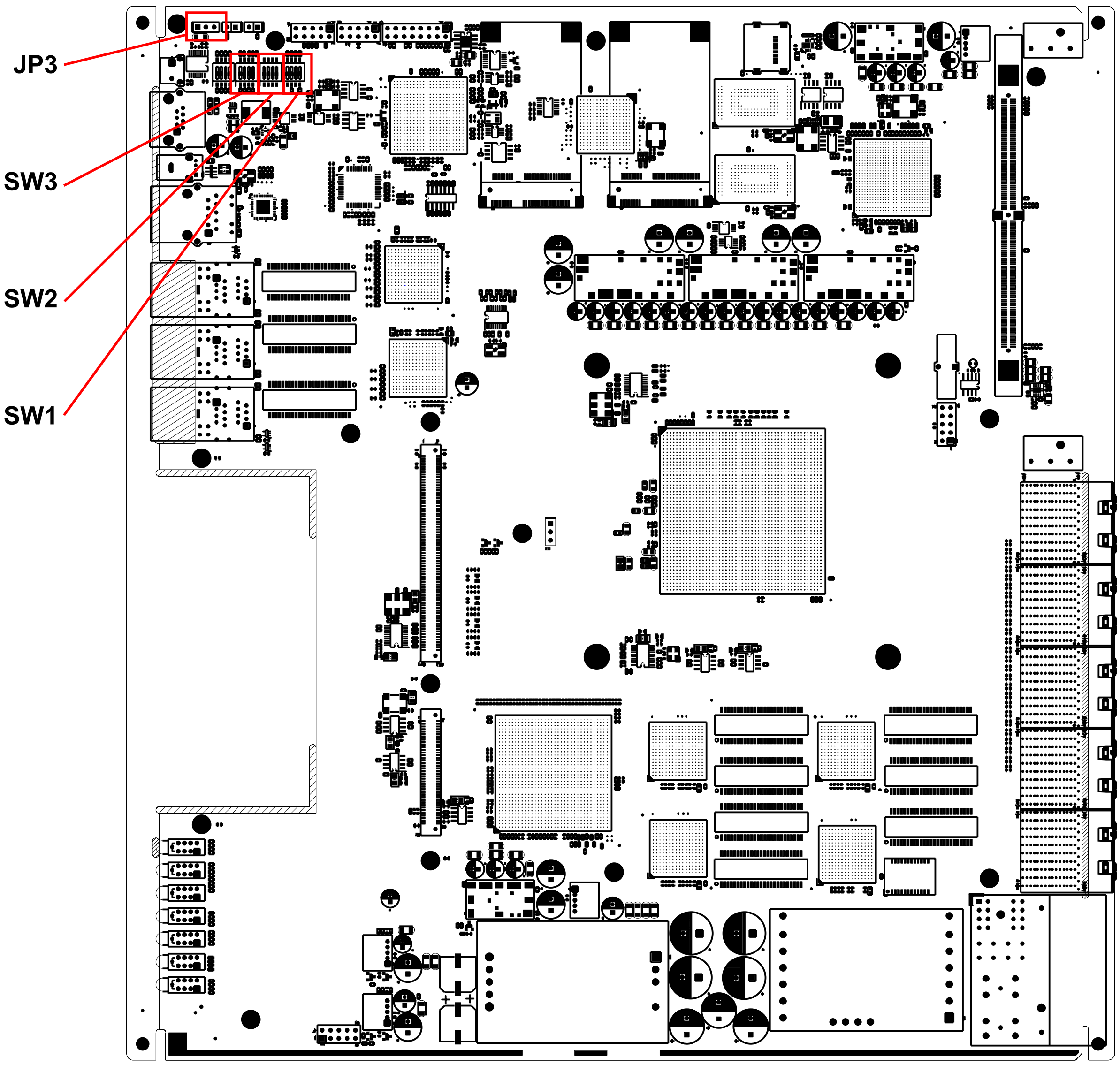


Figure 2. Configurable Component Locations

Headers and Jumpers

- **Ground Connection (JP3):** This header is used to short GND and GND_SHELF on the board. The default setting is Pin 1 and Pin 2 shorted.

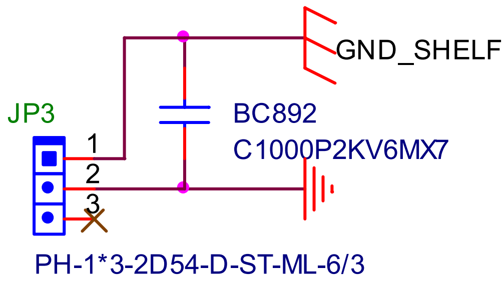


Figure 3. Ground Header Schematic (JP3)

GND Connection	JP3
Short GND and Chassis GND by capacitor	3 2 1
GND not shorted	3 2 1

Table 6. Ground Header Settings (JP3)

- **XAUI_SEL Status (JP5):** This header is a reserved hardware switch. The default configuration of XAUI_SEL status is set by IPMC through keying in instructions.

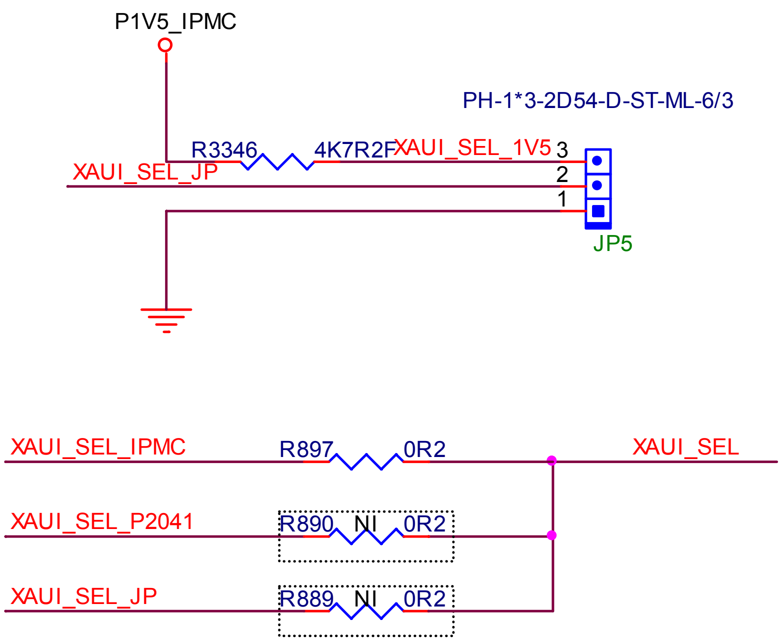


Figure 4. XAUI_SEL Status Header Schematic (JP5)

Pin	Description
1	BCM56842 connects to BCM56334 (HiGig)
0	BCM56842 connects to aDB3710 (BCM8706)

Table 7. XAUI_SEL Status Settings (JP5)

- **IPMC JTAGSEL Mode (JP8):** This header is used to select either FPGA Fabric TAP or Cortex-M3 JTAG debug. The default setting is FPGA Fabric TAP.

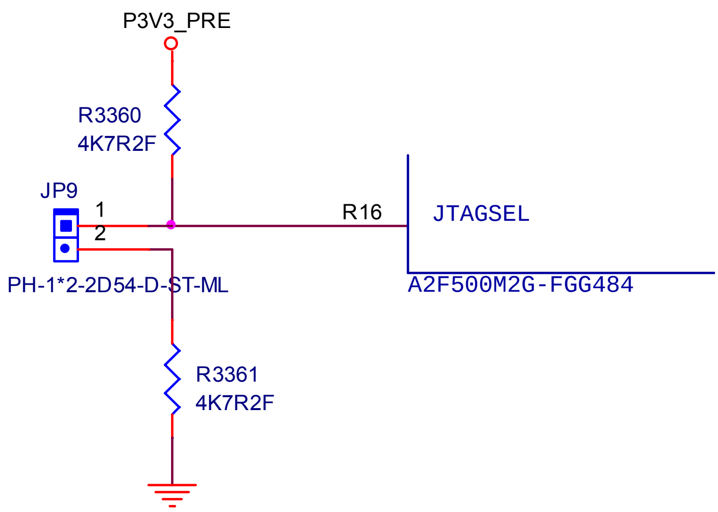


Figure 5. JTAGSEL Mode Header Schematic (JP8)

Name	Type	Polarity/Bus Size	Description
JTAGSEL	In	1	JTAG controller selection Depending on the state of the JTAGSEL pin, an external JTAG controller will either see the FPGA fabric TAP/auxiliary TAP (High) or the Cortex-M3 JTAG debug interface (Low). The JTAGSEL pin should be connected to an external pull-up resistor such that the default configuration selects the FPGA fabric TAP.

Table 8. JTAGSEL Pin Definition (JP8)

- **IPMC JTAG (JP9):** This header is used to program the IPMC bit file using a JTAG cable.

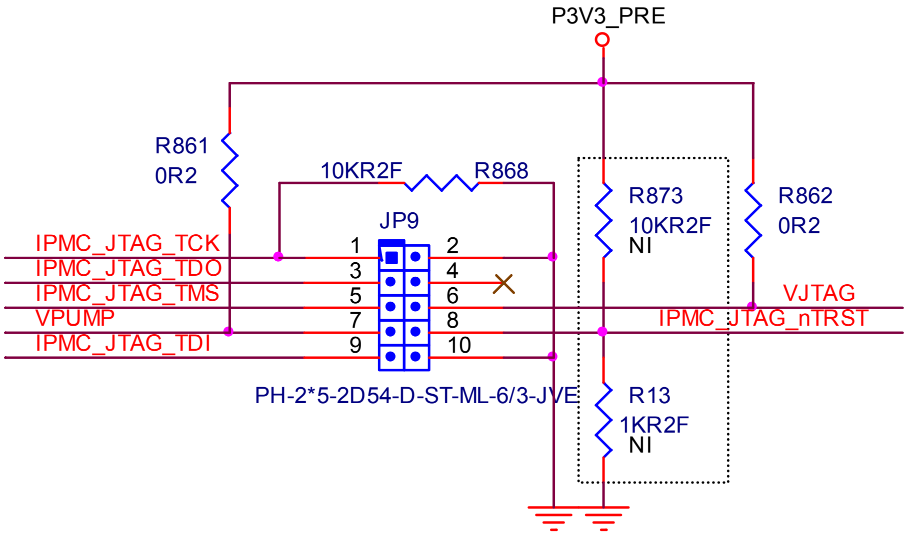


Figure 6. IPMC JTAG Header Schematic (JP9)

- **JTAG Header (JP12):** This header is used to reprogram the CPLD bit file using a JTAG cable.

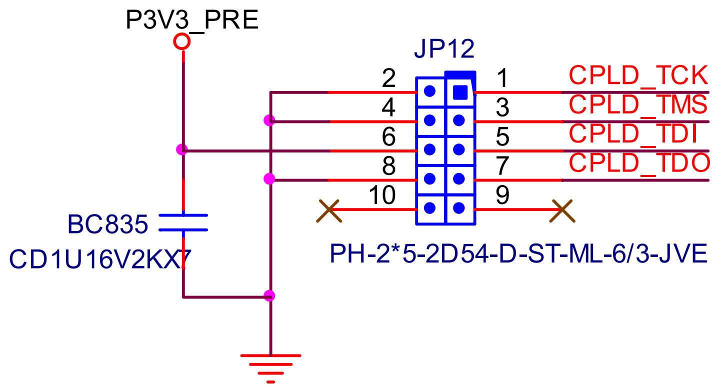


Figure 7. CPLD JTAG Header Schematic (JP12)

DIP Switches

- **SW1:** SW1 is used to switch between **SPI flash boot** and **SD card boot**. The default setting is SPI flash boot.

<table>
<tr><th>SW No.</th><th>Mode</th><th colspan="3">Setting</th></tr>
<tr><td rowspan="8">SW1</td><td rowspan="4">SPI Flash</td><td>1</td><td>OFF</td><td rowspan="4">
</td></tr>
<tr><td>2</td><td>ON</td></tr>
<tr><td>3</td><td>ON</td></tr>
<tr><td>4</td><td>OFF</td></tr>
<tr><td rowspan="4">SD Card</td><td>1</td><td>ON</td><td rowspan="4">
</td></tr>
<tr><td>2</td><td>OFF</td></tr>
<tr><td>3</td><td>OFF</td></tr>
<tr><td>4</td><td>ON</td></tr>
</table>

Table 9. SPI Flash or SD Card Selection (SW1)

- **SW2:** The front panel **serial port** is set to **connect to the LMP console** by default. For testing purposes, the serial port can be configured to connect to the **IPMC console** as shown in the following table. The baud rate is115200 for the LMP console and 9600 for the IPMC debug console.

<table>
<tr><th>SW No.</th><th>Mode</th><th colspan="3">Setting</th></tr>
<tr><td rowspan="8">SW2</td><td rowspan="4">LMP Console</td><td>1</td><td>ON</td><td rowspan="4">
</td></tr>
<tr><td>2</td><td>ON</td></tr>
<tr><td>3</td><td>OFF</td></tr>
<tr><td>4</td><td>OFF</td></tr>
<tr><td rowspan="4">IPMC
Debug Console</td><td>1</td><td>OFF</td><td rowspan="4">
</td></tr>
<tr><td>2</td><td>OFF</td></tr>
<tr><td>3</td><td>ON</td></tr>
<tr><td>4</td><td>ON</td></tr>
</table>

Table 10. Faceplate Serial Port Selection (SW2)

- **SW3:** This is a multi-function switch. Pin 1 is used to select **Shelf Mode** or **Stand Alone Mode**. Pin 2 is used to select between **boot from SPI Flash 0** or **boot from SPI Flash 1**. Pin 3 is used to select **compliance to PICMG 3.0** or **PICMG 3.1**. Pin 4 is used to manually close the **Hot Swap switch**. If Pin 4 is "ON" (connected to GND), this has the same effect as closing the Hot Swap switch SW5 (blade inserted).

SW No.	Mode	Setting		Mode	Setting	
SW3	Shelf Mode	1	OFF	Stand Alone Mode	1	ON
	Boot from SPI Flash 0	2	OFF	Boot from SPI Flash 1	2	ON
	PICMG 3.0	3	OFF	PICMG 3.1	3	ON
	Handle	4	OFF	DIP Handle	4	ON

Table 11. Multi-function Switch (SW3)

Programmable Devices

There are programmable devices with their own images on the board. The board is provided with default images programmed for all devices as described in Table 12.

Component	Description	Content
SPI flash memory	SST25VF080B	U-Boot image
IPMC	A2F500M3G-FGG484I	IPMC image
EEPROM	M24256 (256Kb)	IPMI variables
microSD card	DS2M-08GI81AC1ST	Linux and user application
CPLD	LCMX0640C3FTN256C	CPLD Image

Table 12. Programmable Devices

4.2.2 Connecting to the Blade

Connecting to the aTCA-3430 via COM port

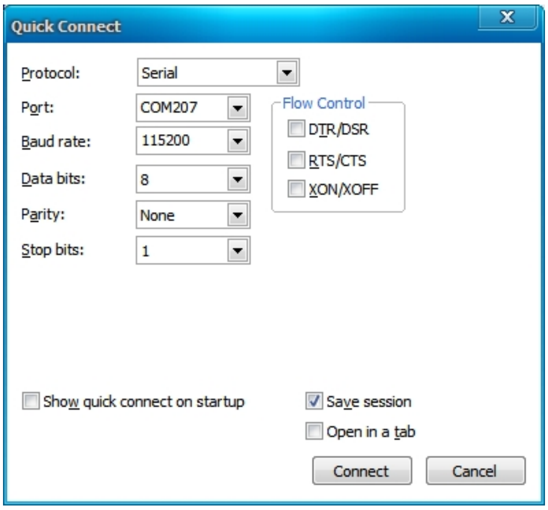
Step 1

Turn on the aTCA-3430. Connect the USB port of a laptop/PC to the LMP via the front panel COM port (RJ-45) on the aTCA-3430 using an RJ-45-to-USB adapter.

COM port

Step 2

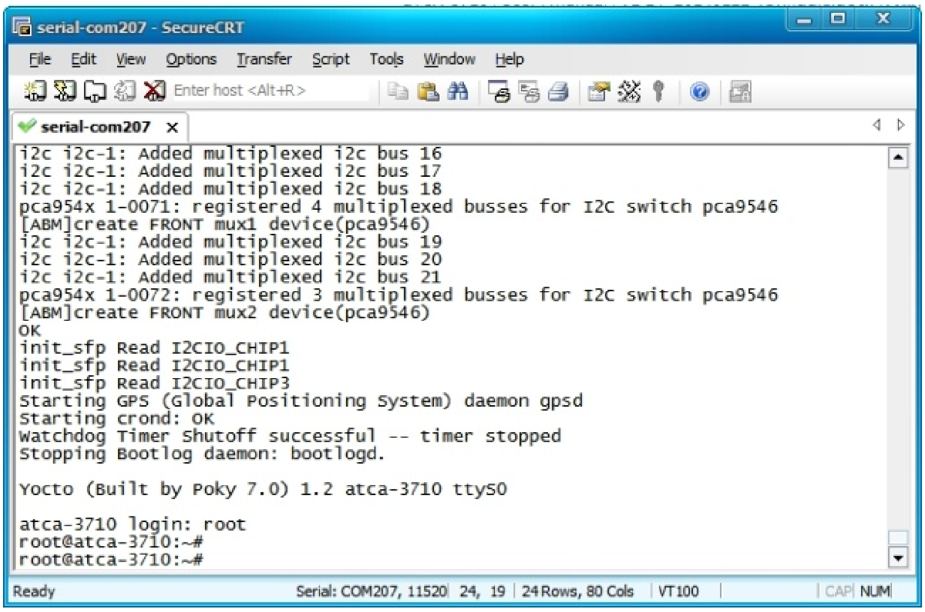
Start a terminal emulator application (e.g. SecureCRT) on the laptop/PC with the following settings: corresponding laptop/PC COM port, 115,200 baud, 8 data bits, no parity, one stop bit and no flow.



Step 3

Login to the aTCA-3430.

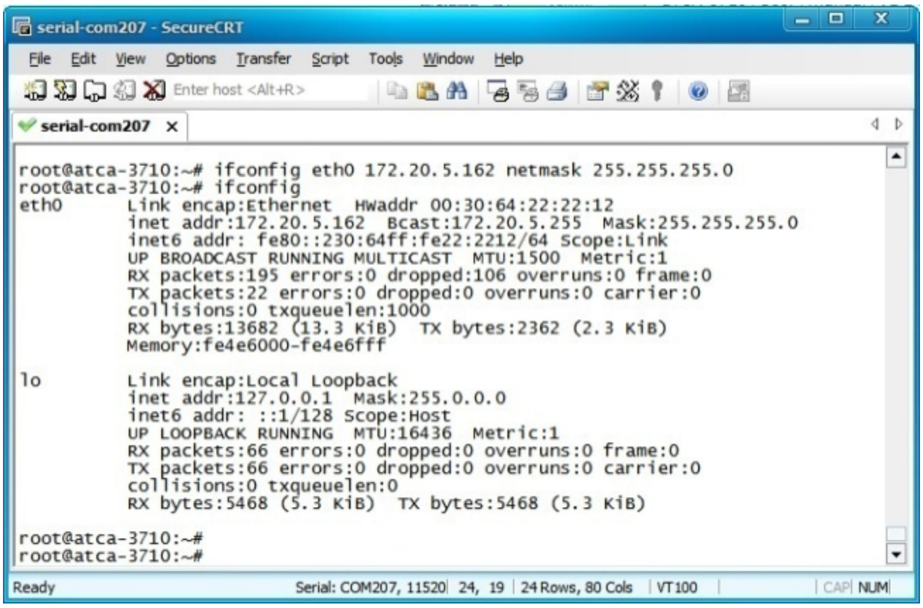
User: root
Password: (no password)



Step 4

Set the IP address of eth0, for example:

```
root@aTCA-3430:~# ifconfig eth0 172.20.5.162 netmask 255.255.255.0
```



Connecting to the aTCA-3430 remotely

Before connecting to the aTCA-3430 remotely, you must configure the IP address of the LMP management port. If there is no IP address, please configure it first by following the instructions above in "Connecting to the aTCA-3430 via COM port".

Step 1

Turn on the aTCA-3430.

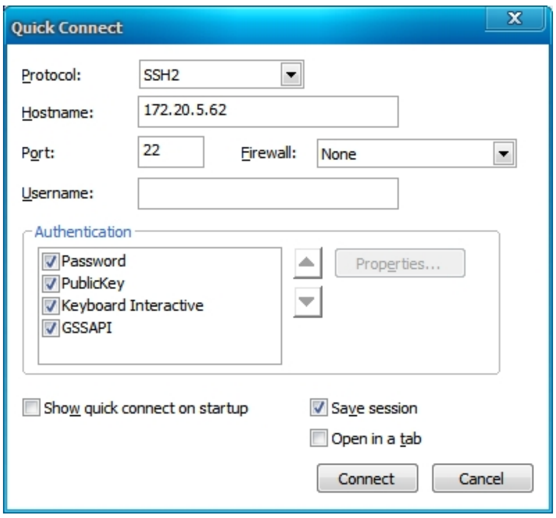
Step 2

Connect the Ethernet port of a laptop/PC to the LMP Mgmt port on the front panel of the aTCA-3430 using an Ethernet cable.

LMP Mgmt port

Step 3

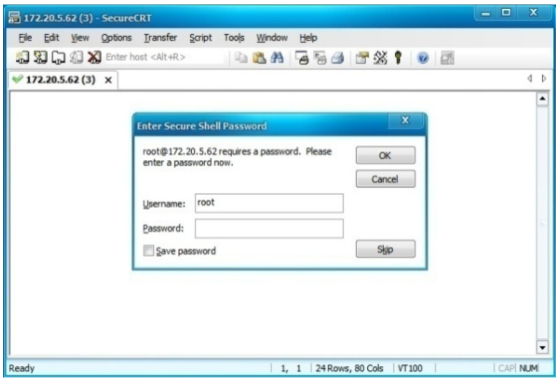
Start a terminal-emulator application (e.g. SecureCRT) on the laptop/PC with the IP of the aTCA-3430, for example (assuming IP address of LMP MGT port is 172.20.5.62):

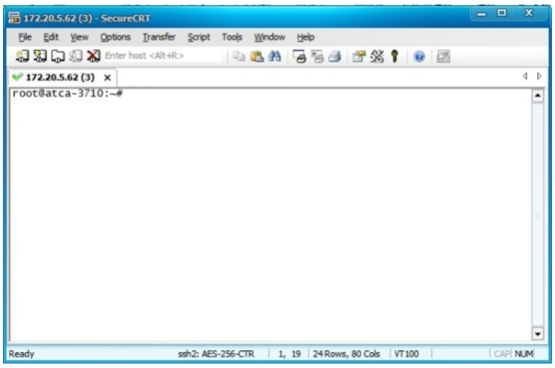


Step 4

Login to the aTCA-3430.

User: root
Password: (no password)





Boot into CLI for Base Switch Management

BCM SDK will start automatically when the aTCA-3430 boots up. The user can boot into CLI for Base switch management as follows:

1. Login to the LMP OS.
2. Use “telnet localhost 9895” to access the BCM SMB diagnostic shell.

```
root@aTCA-3430:/usr/local/bcm# telnet localhost 9895
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
BCM.0>
```

Boot into CLI for Fabric Switch Management

BCM SDK will start automatically when the aTCA-3430 boots up. The user can boot into CLI for Fabric switch management as follows:

1. Boot into CLI for Base switch management firstly, please refer to "Boot into CLI for Base Switch Management" above.
2. Change the management CLI from Base switch to Fabric switch.

```
root@aTCA-3430:/usr/local/bcm# telnet localhost 9895
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
BCM.0> 1:
Default SOC device set to 1
BCM.1>
```

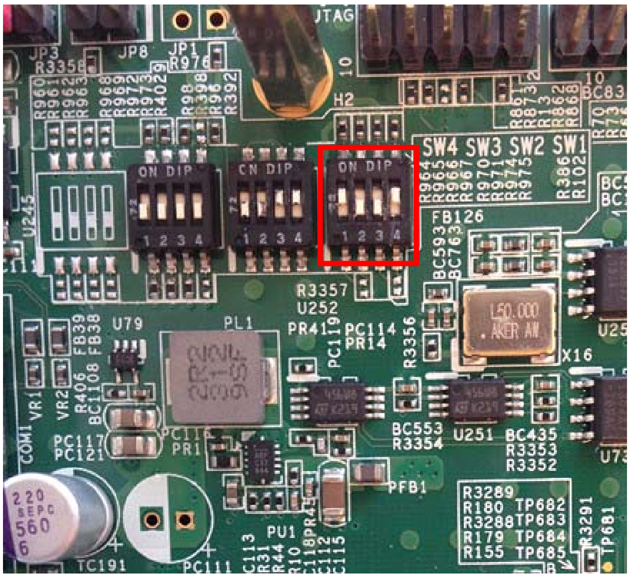
5. Software Setup/Update/Recovery

5.1 U-Boot Installation

5.1.1 Building U-Boot

When there is no U-Boot on the aTCA-3430, perform the following actions

1. Plug in an SD card into a Linux PC (for example, the SD card is recognized as "/dev/sde").
2. Run "**sudo dd if=U-Boot.bin of=/dev/sde bs=512 seek=8 count=1300**" to write a U-Boot image onto the SD card.
3. Boot the aTCA-3430 from the SD card, SW1-1 ON, SW1-4 ON.



4. Copy the U-Boot firmware to SPI flash.

```
=>mmc read 500000 8 514
=>sf probe 0; sf erase 0 0xa0000; sf write 0x500000 0 0xa0000
```

5.1.2 Updating U-Boot

Refer to "BSP/Embedded Linux/BCM SDK Installation" below for detailed information.

5.2 BSP/Embedded Linux/BCM SDK Installation

The steps for BSP installation and update are the same. Please perform the following actions:

```
=> mac port 2
=> mac 0 00:30:64:22:22:12
=> mac 1 00:31:64:22:11:23
=> mac save
Programming passed.
EEPROM:OK
=> mac
MAC EEPROM Contents:
Eth0: 00:30:64:22:22:12
Eth1: 00:31:64:22:11:23
System Flags: 0xff
CRC: 79c14dc7
```

Install TFTP server (tftp-server) and put the BSP upgrade files at tftpboot. Below is a sample tftp configuration in CentOS.

```
    service tftp
{
    socket_type     = dgram
    protocol        = udp
    wait            = yes
    user            = root
    server          = /usr/sbin/in.tftpd
    server_args     = -s /home/work/ATCA_3430/target/boot -c
    disable         = no
    per_source      = 11
    cps             = 100 2
    flags           = IPv4
}
```

```
[root@dell-3 ~]# service xinetd restart
[root@dell-3 ~]# ls /home/work/ATCA_3430/target/boot
aTCA-3430.dtb                              rootfs.ext2.gz.uboot   vendor-drops.tgz
fsl_fman_ucode_P2040_106_1_4.bin.ucode   u-boot.bin
fsl-image-full-rootfs.tar.gz             uImage
```

Boot into U-Boot:

```
=> setenv ipaddr   <board_ip>
=> setenv serverip   <server_ip>
=> run initrd
```

Update U-Boot/BSP/BCM-SDK by executing /sbin/mmcsd_lmp-installer. Change the IP address and TFTP server IP to those of your actual environment:

```
root@ p2040rdb:~# /sbin/mmcsd_lmp-installer   all   <board_ip>   <server_ip>
[Wait for about 20 minutes]
root@ p2040rdb:~# reboot
```

```
root@aTCA-3430:~# /sbin/lmp-installer
fsl-image-full-rootf     1% |                                   |  3980k   0:01:45 ETA
...............
***** start of config_uenv
***** end of config_uenv
root@aTCA-3430:~# reboot
```

5.3 Redundant LMP Firmware & Boot

The U-Boot image is stored in SPI flash memory. On the aTCA-3430, the LMP has two such U-Boot flash memories (primary and redundant).

5.3.1 Boot Auto-Switch

The user can enable the boot auto-switch function to U-Boot to automatically switch to the redundant flash when the primary flash memory fails.

1. Connect to the aTCA-3430 via COM port and enter U-Boot prompt.

```
U-Boot 2011.09-svn15 (Dec 09 2013 - 10:32:33)
CPU0: P2040E, Version: 2.0, (0x82180120)
Core: E500MC, Version: 3.2, (0x80230032)
…………………
Net:    Initializing Fman
SF:     Detected SST25VF080B with page size 4 KiB, total 1 MiB
Fman1: Data at 7fe32630 is not a firmware
No ethernet found.
Hit any key to stop autoboot:   0
=>
```

2. Enable boot auto-switch and check the status. “0” means the boot auto-switch function is disabled; “1” means the boot auto-switch function is enabled.

```
=> ipmi auto-boot-switch 1
=> ipmi auto-boot-switch
Auto boot switch status: 1 (0: disable, 1: enable)
```

5.3.2 Boot Manual Switch

The user can also manually set which flash memory U-Boot boots from by using a command at the U-Boot prompt.

```
=> ipmi active-flash
active-flash: 0
=> ipmi switch-active
=> ipmi active-flash
active-flash: 1
```

5.4 IPMI Firmware Update Procedure

The aTCA-3430 supports firmware update (IPMC FW) over various interfaces (LAN, serial interface or IPMB). Please follow the procedures listed below to update the IPMC firmware.

Note: IPMB-0 will be disabled during the IPMC firmware update process. This is a limitation of the IPMC controller (SmartFusion A2F500).

5.4.1 Update over Serial Interface

The following IPMItool command line parameters are used for communicating with the carrier IPMC via a serial interface:

- **-I serial-terminal**

This parameter instructs the IPMItool utility to use the serial interface for communications with the carrier IPMC.

- **-D <dev[:baudrate]>**

This parameter specifies the serial device and baud rate settings to use. For Linux hosts, the serial device is the system path to the device node (e.g. /dev/ttyS0).

Perform the following steps to update the IPMC firmware:

Step 1: Prepare an external host PC with Linux OS and connect it to the serial port on the aTCA-3430 via the COM port (USB Mini-B on the front panel). Put the IPMItool utility and new firmware image on the host PC. Enter the following command:

```
[root@localhost 3430]# ./ipmitool –I serial-terminal –D /dev/ttyS0:115200 hpm upgrade
hpm1fw.img activate
```

Step 2: Enter “y” when prompted and wait until the string “firmware update procedure successful” is displayed.

5.4.2 Update over LAN

The following IPMItool command line parameters are used for communicating with the carrier IPMC via LAN:

- **-I lan**

The parameter instructs the IPMItool utility to use the RMCP protocol for communicating with the IPMC.

- **-H <IP address >**

The parameter specifies the IP address of the IPMC.

Perform the following steps to update firmware:

Step1: Prepare an external host PC with Linux OS and connect it to the target aTCA-3430 via Base Interface. Put the IPMItool utility and the new firmware image on the host PC. Enter the following command:

```
[root@localhost 3430]# ./ipmitool –I lan –H 172.17.172.134 hpm upgrade hpm1fw.img
activate
```

Step2: Select “y” when prompted and wait until the string “firmware update procedure successful” is displayed.

To update other images (IPMC BOOT LOADR, FPGA, etc), just replace the target image and the file name while typing command.

Item	File Name
IPMC firmware	hpm1fw.img
IPMC Boot Loader	hpm1boot.img
FPGA	hpm1iap.img

Table 13. Firmware Image and File Name

Note: Make sure the payload power is off (M1 state) before updating the FPGA firmware.

6. Configuring and Managing the Fabric Switch

Refer to the “BMC SMB Quick Start Guide” for detailed information. To receive a copy of this document, please contact your ADLINK representative.

7. Advanced Operation

7.1 Switching I/O between Front Panel and Base Switch

The Fabric Switch (BCM56842) connects to SFP+ ports on the front panel by default. One 10GbE port can be switched to the Base Switch (BCM56334). Refer to the red square in Figure 8 below.

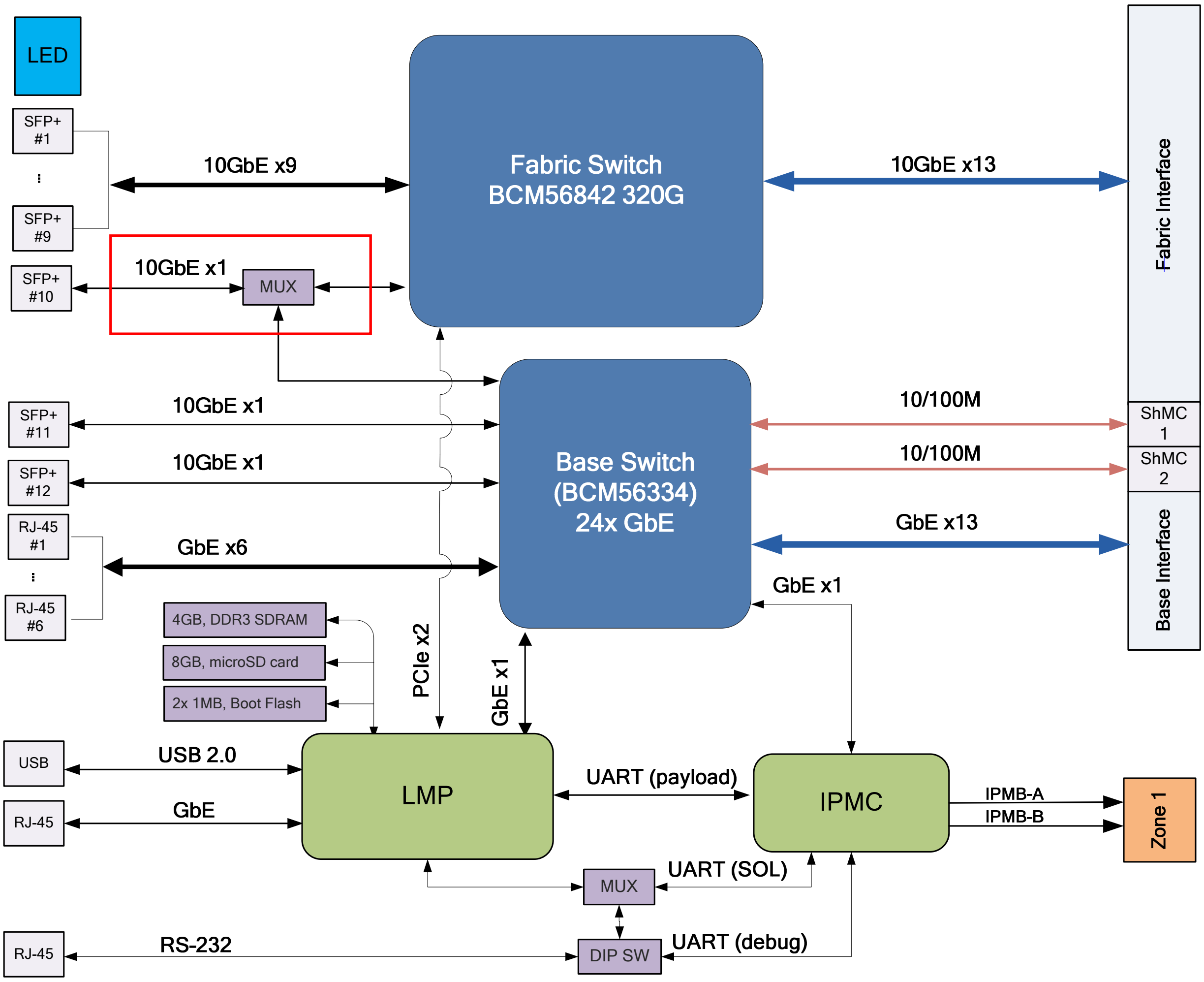


Figure 8. Switching I/O between Front Panel and Base Switch

Check the switch status. The BCM56842 connects to the front panel by default.

```
root@aTCA-3430:~# ipmitool raw 0x2e 0x71 0x13 0x5f 0x00
 13 5f 00 01
```

Switch one 10GbE port of the BCM56842 to the Base Switch (BCM56334) and check the status.

```
root@aTCA-3430:~# ipmitool raw 0x2e 0x70 0x13 0x5f 0x00 0x00
 13 5f 00
root@aTCA-3430:~# ipmitool raw 0x2e 0x71 0x13 0x5f 0x00
 13 5f 00 00
```

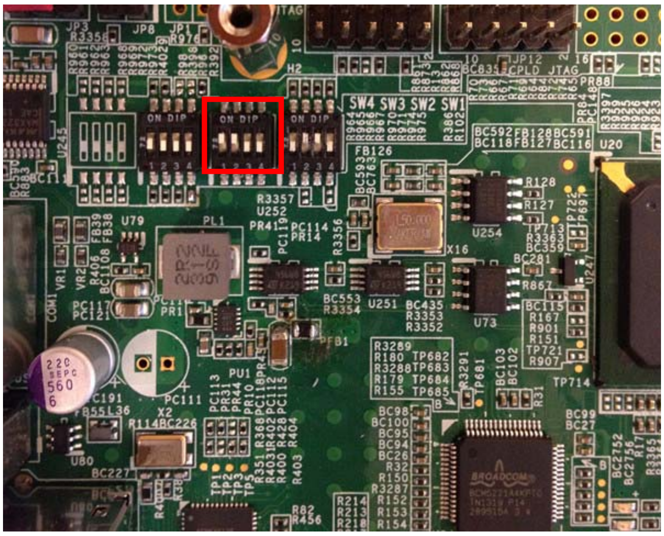
Set the BCM56842 to default status.

```
root@aTCA-3430:~# ipmitool raw 0x2e 0x70 0x13 0x5f 0x00 0x01
 13 5f 00
```

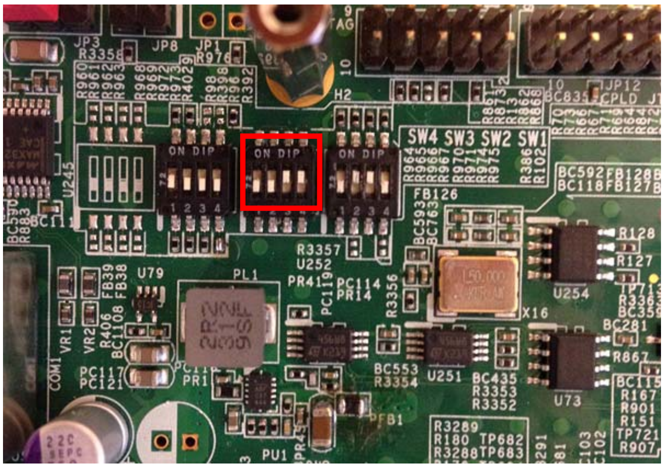
7.2 Switch UART Serial Port between Front Panel and IPMC

One UART serial port connects to either the front panel RJ- 45 console port or to the SOL port (Smart Fusion A2F500 UART #0), but not to both at the same time.

The user can switch the RJ-45 serial port on the front panel to connect to either the LMP or to the IPMC. The UART serial port connects to the LMP by default (SW2-1 ON, SW2-2 ON).



The UART serial port connects to the IPMC in debug mode (SW2-3 ON, SW2-4 ON).



8. Architecture Overview

8.1 LMP Subsystem

The aTCA-3430 has two processors onboard: the Local Management Processor (LMP) P2040 and the SmartFusion IPMC. Therefore, on the blade, we have two software suites: the LMP software suite, and the IPMC software suite. Each software suite comes in the form of a bootloader image and an OS image in one or more of the flash memories on the board. The LMP software suite, a dedicated board management and control plane module, includes the U-Boot Bootloader, the Open Linux OS, the Broadcom switch software, the IPMI software and the LMP ADLINK Board Management. All the functional modules other than U-Boot Bootloader are part of the LMP OS image. The IPMC software suite, a chassis management module, includes the vendor’s bootloader, OS and IPMI package.

ADLINK patches have been applied to many of the standard modules, include the following functions.

- Boot image redundancy
- Device drivers
- H/W diagnostics
- S/W image upgrade

8.1.1 Boot Image Redundancy

The aTCA-3430 software package provides boot image redundancy to survive a single point of failure during the boot process. When a device boots up from an image stored in a storage device, the system is guaranteed to successfully boot by having redundant bootable images stored separately in primary and redundant storage devices. The bootloader U-Boot image and the Linux operating system image are stored in different storage devices.

The aTCA-3430 supports LMP U-Boot image redundancy

U-Boot Redundancy

The U-Boot image is stored in an SPI flash memory. On the aTCA-3430, the LMP has two such U-Boot flash memories: primary and redundant. The U-Boot Redundancy Flow is shown in Figure 9 below.

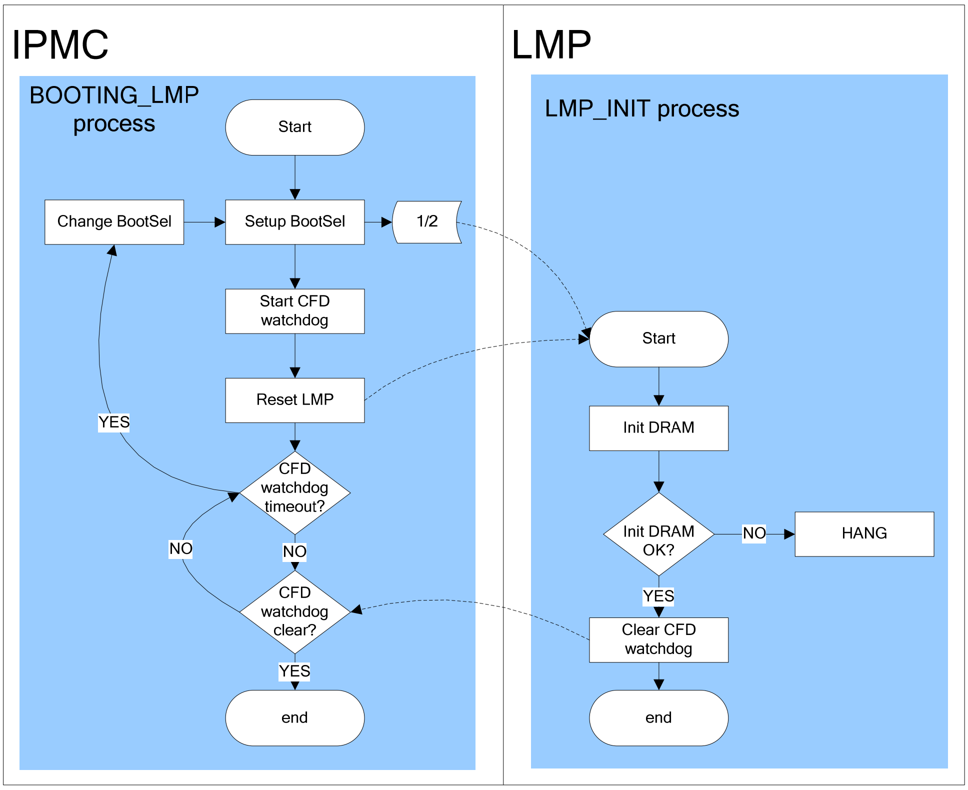


Figure 9. U-Boot Redundancy Flow

The actions for each step are described in Table 14

Domain	Name	Description
IPMC (BOOTING_LMP)	Setup BootSel	Sets LMP SPI CS0. (SPI_FLASH1 or SPI_FLASH2) In IPMC Standalone mode, irrespective of IPMC configuration, user can select BootSel using H/W switch.
	Start CFD watchdog	timeout: 2 sec
	Change BootSel	Changes the Bootsel setting.
LMP (LMP_INIT)	Start	IPMC selects a booting device from either SPI_FLASH1 or SPI_FLASH2 and triggers the LMP to boot up.
	HANG	This is a state at which U-Boot booting code is stuck without doing anything (which may happen at problematic situations such as DRAM initialization faults). Once 2 seconds pass at this state, the IPMC CFD watchdog resets the LMP.
	ClearCFD watchdog	The LMP requests the IPMC to clear CFD watchdog. The request signal is forwarded to the IPMC through IPMI interface.

Table 14. LMP U-Boot Boot-up Failover Actions

8.1.2 LMP SDK/BSP Porting (U-Boot file system)

The LMP-SDK used is the Local Management Processor P2040 SDK v1.3, provided by Freescale and distributed in an ISO file. After installation, the default directory generated is QorIQ-SDK-V1.3-20121114-yocto.

The directory structure follows that of Linux Target Image Builder (LTIB, http://ltib.org), which enables bitbaketool to generate target images.

Note: The details for the Freescale SDK installation and operation are found in ~/documents after ISO installation.

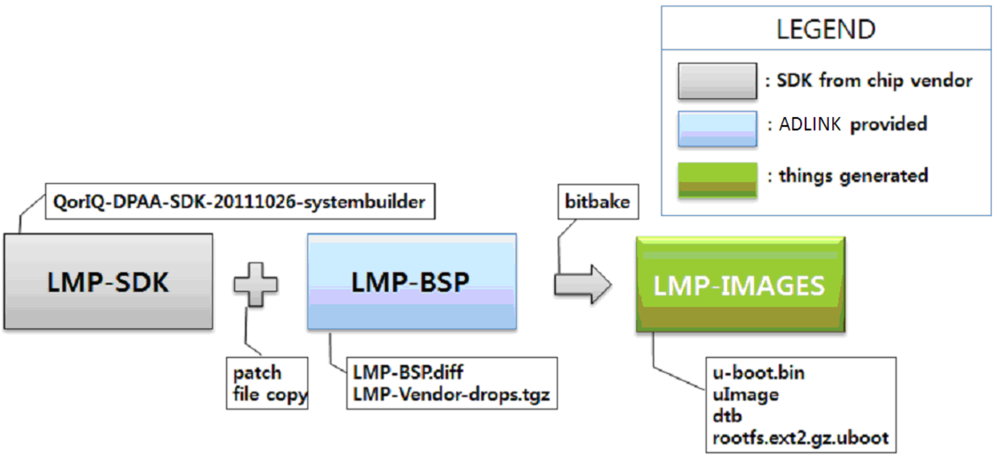


Figure 10. LMP SDK/BSP Porting

8.1.3 Device Drivers

The device drivers provide accessibility to the devices on the aTCA-3430 blade. The vendor’s drivers are ported to the blade environment with necessary changes.

Device	ID	Description	Host	Program	Remark
P2040	LMP	Local Management Processor	LMP	(All LMP Linux programs)	LMP-SDK + ADLINK patch
Mini VLP DIMM	LMP_MEM	DRAM for LMP	LMP	LMP linux kernel	LMP-SDK + ADLINK patch
BCM56842	FABRIC_SWITCH	multilayer switch	LMP	bcm.user	BCM-SDK + ADLINK patch
BCM56334	BASE_SWITCH	base switch	LMP	bcm.user	BCM-SDK +ADLINK patch
CPLD	CPLD	CPLD for system control	LMP	adlik-cpld	ADLINK
BCM54612E	MGMT_PHY	PHY for mgmt	LMP	adlk-mdio	ADLINK

Device	ID	Description	Host	Program	Remark
		Ethernet port of LMP			
M24256	LMP_EEPROM	mac addresses for LMP	LMP	adlk-eeprom	ADLINK
DS1388	RTC	Real Time Clock	LMP	date, hwclock	LMP-SDK (Linux standard utilities)
MAX5820	PWR_CTRL	power control for FABRIC_SWITCH	LMP	i2cget, i2cset...	LMP-SDK (Linux standard utilities)
Front SFP(+)	FP1,FP2,FP3,FP4	Front SFP(+) module	LMP	i2cget, i2cset...	LMP-SDK (Linux standard utilities)
I2CIO	F_I2CIO	I2C to IO buffer	LMP	i2cget, i2cset...	LMP-SDK (Linux standard utilities)
PCA9546	F_I2CHUB	I2C HUB device	LMP	(kernel)	virtual I2C bus
SPI_FLASH	SPI_FLASH1 SPI_FLASH2	boot flash for U-Boot	LMP	mtd-utilities	LMP-SDK + ADLINK patch Linux MTD system based
A2F500	IPMC	IPMC	LMP	ipmitool	open source + ADLINK patch
A2F500	IPMC	IPMC	SHMC	-	PICMG standard

Table 15. Summary of Devices and Access

8.1.4 LMP State Machines

The LMP State machine is illustrated in Figure 11.

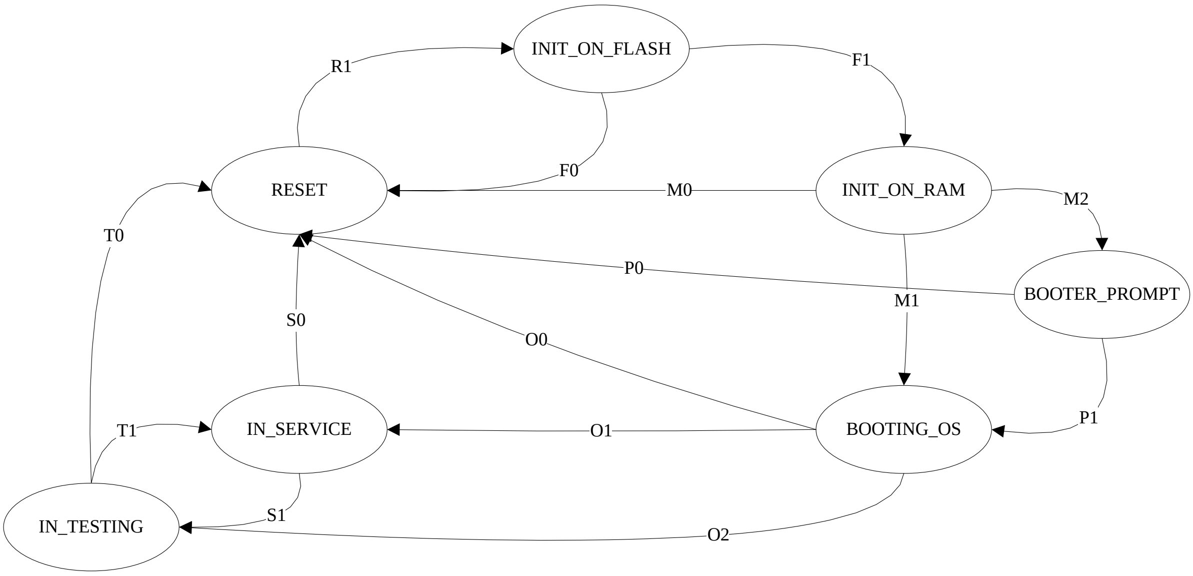


Figure 11. LMP State Machine

State	Description
RESET	Resets the LMP and LMP peripheral devices.
INIT_ON_FLASH	The Bootloader at the flash address space runs and initializes devices such as DRAM device. Copies the bootloader code to the DRAM. Enables the BMC watchdog. (timeout: 30 sec) Disables the CFD watchdog.
INIT_ON_RAM	The Bootloader at RAM address space runs and initializes the peripheral devices.
BOOTER_PROMPT	Disables the BMC watchdog. Waits for a User command input.
BOOTING_OS	Disables the BMC watchdog. Triggers the OS booting.
IN_SERVICE	Performs the LMP services. aTCA-3430 board management services include the following: - ipmievd: IPMI message processing daemon Other services defines by a user can be included.
IN_TESTING	Performs testing

Table 16. LMP State Descriptions

Transition	Name	Conditions
RESET->INIT_ON_FLASH	R1	The bootloader is present at the boot flash.
INIT_ON_FLASH->RESET	F0	The CFD watchdog disable processing fails in 2 sec after Reset.
INIT_ON_FLASH->INIT_ON_RAM	F1	The program jumps to the bootloader code region in the DRAM.
INIT_ON_RAM->RESET	M0	The BMC watchdog disable processing fails in 30 sec after entering INIT_ON_RAM state.
INIT_ON_RAM->BOOTING_OS	M1	An OS loading command is saved into the Bootcmd environment variables.
INIT_ON_RAM->BOOTER_PROMPT	M2	The bootcmd environment variable are not present or the OS loading command is not correct..
BOOTER_PROMPT->RESET	P0	Reset command is performed.
BOOTER_PROMPT->BOOTING_OS	P1	The OS loading command is performed.
BOOTING_OS->RESET	O0	The BMC watchdog timeout triggered by the bootloader occurs.
BOOTING_OS->IN_SERVICE	O1	The OS application defined as LMP services run normally.
BOOTING_OS->IN_TESTING	O2	Enters into the OS test mode.
IN_SERVICE->RESET	S0	The reboot commandis performed.
IN_SERVICE->IN_TESTING	S1	The OS application defined as an LMP service halts some functions.
IN_TESTING->RESET	T0	The reboot commandis performed.
IN_TESTING->IN_TESTING	T1	The OS application defined as LMP services runs normally.

Table 17. LMP State Transition Descriptions

8.1.5 Boot Sequence

The boot sequence of devices with a CPU core is illustrated in Figure 12. The IPMC is responsible for initiation of the booting sequence. The states in the boot sequence are summarized in Table18.

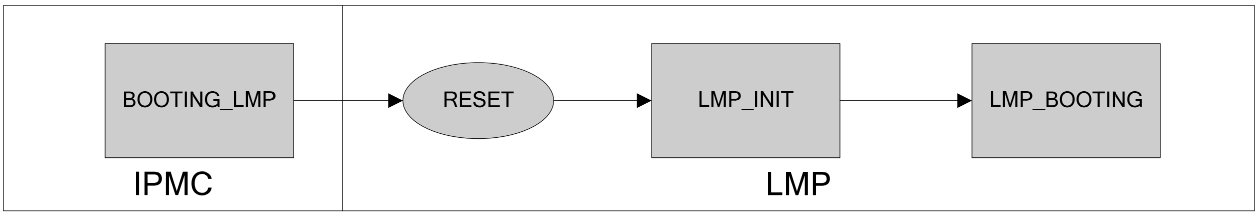


Figure 12. aTCA-3430 Boot Sequence

Host	Process	Conditions
IPMC	BOOTING_LMP	Configures the LMP boot flash and resets the LMP. Refer to Figure 4-1 LMP U-Boot booting flow.
LMP	LMP_INIT	Initializes associated devices. Refer to Figure 4-1 LMP U-Boot booting flow.
	LMP_BOOTING	Triggers the LMP OS booting. Refer to Figure 4-2 LMP OS booting flow

Table 18. Boot Sequence State Descriptions

8.1.6 Non-volatile Memory Mapping

The aTCA-3430 provides various non-volatile memories (NVM) to store software images and log system events for different purposes.

The memory map for the devices is shown in Table 19.

Host	Device	Size	Contents	format	U-Boot	linux	Remark
LMP	SPI_FLASH1	0xB0000	U-Boot image	binary	read/write	/dev/mtd0	Same S/W access point to SPI_FLASH1, SPI_FLASH2. Selected by a CPLD register
		0x20000	U-Boot Env.	binary	read/write	/dev/mtd1	
		0x20000	Fman-Ucode	binary	read/write	/dev/mtd2	
		0x20000	Reserved	binary	Read/write	/dev/mtd3	
	SPI_FLASH2	0xB0000	U-Boot image	binary	read/write	/dev/mtd0	
		0x20000	U-Boot Env.	binary	read/write	/dev/mtd1	
		0x20000	Fman-Ucode	binary	read/write	/dev/mtd2	
		0x20000	Reserved	binary	read/write	/dev/mtd3	
	SD CARD	512 MiB	OS images	VFAT	read only	/dev/mmcblk0p1 (/bootA)	
		7680MiB	System config	EXT3	no access	/dev/mmcblk0p2 (/var/NVMA)	

Table 19. Non-volatile Memory Map

8.2 Switch Subsystem

The switch subsystem includes Broadcom driver/SDK porting, and ADLINK switch software running over the Broadcom SDK. The ADLINK Switch Manager software includes all Layer 2 and Layer 3 switching functions.

The Fabric & Base Switch (BCM56842/56846/56334) can also be paired with the ADLINK Switch Manager software for management. The ADLINK Switch Manager includes functions of port configuration, customized port mirror, VLAN setting, trunk group, ACL, static route, and management API with a more user-friendly CLI to enable more straightforward API development.

Details on the ADLINK Switch Manager release software can be found in the ADLINK Switch Manager Configuration Guide and ADLINK Switch Manager API Programming Guide. It will not be covered in this document.

Under default settings, the system will boot into the BCM SDK shell. Please contact your ADLINK representative to order the ADLINK Switch Manager software.

8.2.1 Broadcom SDK

After the Broadcom SDK is running successfully, the diagnostic shell can be used, providing a set of APIs.

The diagnostic shell provides rich set of commands to control Broadcom switching chips. The shell includes some common diagnostic commands and low level commands. It can be used to configure switching tables (L2, L3, FP), and to get and set the registers. So it is also an invaluable tool for diagnosing problems.

The APIs are defined in terms of high-level concepts such as ports, abstract L2 entries, routing table entries, and VLAN. There is no need to program registers directly. The APIs support all chip features, including physical port control, switching port control, VLAN control, L2/L3 table management, mirroring and filtering.

The SDK also provides a diagnostic test suite.

The engineer compiles the Broadcom SDK as shown below in Figure 13 resulting in an application and two kernel modules. The libraries are used for the APIs.

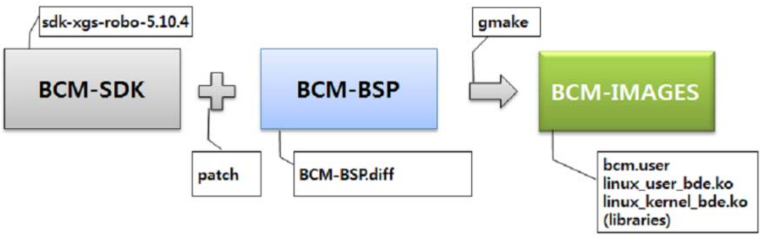


Figure 13. Broadcom SDK Porting

8.3 IPMI Subsystem

8.3.1 Platform Management Overview

The purpose of the hardware platform management system is to monitor, control, and assure proper operation of AdvancedTCA® boards and other shelf components. The hardware platform management system watches over the basic health of the system, reports anomalies, and takes corrective action when needed. The hardware platform management system can retrieve inventory information and sensor readings as well as receive event reports and failure notifications from boards and other intelligent FRUs. The hardware platform management system can also perform basic recovery operations such as reset of managed entities.

The IPMC controller on the aTCA-3430 supports an “intelligent” hardware management system, based on the Intelligent Platform Management Interface Specification. The hardware management system provides the ability to manage the power, cooling, and interconnect needs of intelligent devices; to monitor events; and to log events to a central repository.

8.3.2 Serial Over LAN (SOL)

Serial Over LAN (SOL) is a remote management feature that allows the IPMC (Smart Fusion A2F500) to redirect the serial console from the blade via an IPMI session over the network with RMCP+ protocol.

The aTCA-3430 supports SOL on the Base Interface which is powered by the BCM56334 Gigabit Ethernet Switch. The BCM56334 Gigabit Ethernet Switch is connected to the IPMC (Smart Fusion A2F500) via the NC-SI interface, which provides remote management capability before the payload power is authorized. Users can use the SOL feature to transmit/receive serial console message from a remote site with full console management functionality.

8.3.3 IPMI Sensors

The following table lists all the sensors supported by the aTCA-3430.

Item	Sensor Name	Sensor Address	Description
(1)	Hot Swap	(0x0)	FRU Hot Swap Sensor
(2)	Version Change	(0x1)	Version Change Sensor
(3)	IPMB Physical	(0x2)	Physical IPMB Sensor
(4)	BMC Watchdog	(0x3)	Watchdog Timer Sensor
(5)	+2.5V	(0x4)	Voltage Sensor Upper Non-Recoverable Threshold = 2.75 Volts Upper Critical Threshold = 2.7 Volts Upper Non-Critical Threshold = 2.65 Volts Lower Non-Critical Threshold = 2.35 Volts Lower Critical Threshold = 2.3 Volts Lower Non-Recoverable Threshold = 2.25 Volts

Item	Sensor Name	Sensor Address	Description
(6)	+3.3V	(0x5)	Voltage Sensor Upper Non-Recoverable Threshold = 3.63 Volts Upper Critical Threshold = 3.56 Volts Upper Non-Critical Threshold = 3.5 Volts Lower Non-Critical Threshold = 3.1 Volts Lower Critical Threshold = 3.04 Volts Lower Non-Recoverable Threshold = 2.97 Volts
(7)	+12V	(0x6)	Voltage Sensor Upper Non-Recoverable Threshold = 13.2 Volts Upper Critical Threshold = 12.96 Volts Upper Non-Critical Threshold = 12.72 Volts Lower Non-Critical Threshold = 11.28 Volts Lower Critical Threshold = 11.04 Volts Lower Non-Recoverable Threshold = 10.8 Volts
(8)	MAC AVS +1V	(0x7)	Voltage Sensor Upper Non-Recoverable Threshold = 1.1 Volts Upper Critical Threshold = 1.08 Volts Upper Non-Critical Threshold = 1.06 Volts Lower Non-Critical Threshold = 0.94 Volts Lower Critical Threshold = 0.92 Volts Lower Non-Recoverable Threshold = 0.9 Volts
(9)	+1.5V	(0x8)	Voltage Sensor Upper Non-Recoverable Threshold = 1.65 Volts Upper Critical Threshold = 1.62 Volts Upper Non-Critical Threshold = 1.59 Volts Lower Non-Critical Threshold = 1.41 Volts Lower Critical Threshold = 1.38 Volts Lower Non-Recoverable Threshold = 1.35 Volts
(10)	56842 +1V	(0x9)	Voltage Sensor Upper Non-Recoverable Threshold = 1.1 Volts Upper Critical Threshold = 1.08 Volts Upper Non-Critical Threshold = 1.06 Volts Lower Non-Critical Threshold = 0.94 Volts Lower Critical Threshold = 0.92 Volts Lower Non-Recoverable Threshold = 0.9 Volts
(11)	+5V	(0xA)	Voltage Sensor Upper Non-Recoverable Threshold = 5.5 Volts Upper Critical Threshold = 5.4 Volts Upper Non-Critical Threshold = 5.3 Volts Lower Non-Critical Threshold = 4.7 Volts Lower Critical Threshold = 4.6 Volts Lower Non-Recoverable Threshold = 4.5 Volts
(13)	DDR3 VTT +0.75V	(0xC)	Voltage Sensor Upper Non-Recoverable Threshold = 0.83 Volts Upper Critical Threshold = 0.81 Volts Upper Non-Critical Threshold = 0.79 Volts Lower Non-Critical Threshold = 0.71 Volts Lower Critical Threshold = 0.69 Volts Lower Non-Recoverable Threshold = 0.67 Volts
(14)	LMP P2040 +1V	(0xD)	Voltage Sensor Upper Non-Recoverable Threshold = 1.1 Volts

Item	Sensor Name	Sensor Address	Description
			Upper Non-Critical Threshold = 1.08 Volts Upper Critical Threshold = 1.06 Volts Lower Critical Threshold = 0.94 Volts Lower Non-Critical Threshold = 0.92 Volts Lower Non-Recoverable Threshold = 0.9 Volts
(15)	VDD +1.2V	(0xE)	Voltage Sensor Upper Non-Recoverable Threshold = 1.32 Volts Upper Critical Threshold = 1.3 Volts Upper Non-Critical Threshold = 1.28 Volts Lower Non-Critical Threshold = 1.13 Volts Lower Critical Threshold = 1.1 Volts Lower Non-Recoverable Threshold = 1.08 Volts
(16)	IPMC +1.6V	(0xF)	Voltage Sensor Upper Non-Recoverable Threshold = 1.76 Volts Upper Critical Threshold = 1.73 Volts Upper Non-Critical Threshold = 1.69 Volts Lower Non-Critical Threshold = 1.5 Volts Lower Critical Threshold = 1.47 Volts Lower Non-Recoverable Threshold = 1.44 Volts
(17)	48V Current(A)	(0x10)	Current Sensor Upper Non-Recoverable Threshold = 9 Amps
(18)	48V_A Power(V)	(0x11)	Voltage Sensor Upper Non-Recoverable Threshold = 72 Volts Upper Critical Threshold = 64 Volts Upper Non-Critical Threshold = 55 Volts Lower Non-Critical Threshold = 43 Volts Lower Critical Threshold = 41 Volts Lower Non-Recoverable Threshold = 39 Volts
(19)	48V_B Power(V)	(0x12)	Voltage Sensor Upper Non-Recoverable Threshold = 72 Volts Upper Critical Threshold = 64 Volts Upper Non-Critical Threshold = 55 Volts Lower Non-Critical Threshold = 43 Volts Lower Critical Threshold = 41 Volts Lower Non-Recoverable Threshold = 39 Volts
(20)	48V Temp	(0x13)	Temperature Sensor Upper Non-Recoverable Threshold = 95 degrees C Upper Critical Threshold = 85 degrees C Upper Non-Critical Threshold = 75 degrees C Lower Non-Critical Threshold = 0 degrees C Lower Critical Threshold = -5 degrees C Lower Non-Recoverable Threshold = -10 degrees C
(21)	LMP 1st Boot	(0x14)	First LMP flash boot status Sensor
(22)	LMP 2st Boot	(0x15)	Second LMP flash status Sensor
(23)	Payload Reset	(0x16)	Payload reset status Sensor

Sensor Reading (FRU Hot Swap Sensor)

	Byte	Data Field
Request data	1	Sensor Number (FFh = reserved)
Response data	1	Completion Code
	2	Sensor Reading. [7:0] - Not used. Write as 00h.
	3	Standard IPMI byte (See “Get Sensor Reading” in IPMI specification): [7] - 0b = All Event Messages disabled from this sensor [6] - 0b = sensor scanning disabled [5] - 1b = initial update in progress. This bit is set to indicate that a “Re-arm Sensor Events” or “Set Event Receiver” command has been used to request an update of the sensor status, and that update has not occurred yet. Software should use this bit to avoid getting an incorrect status while the first sensor update is in progress. This bit is only required if it is possible for the IPM Controller to receive and process a “Get Sensor Reading or Get Sensor Event Status” command for the sensor before the update has completed. This is most likely to be the case for sensors, such as fan RPM sensors, that may require seconds to accumulate the first reading after a re-arm. [4:0] – reserved. Ignore on read.
	4	Current State Mask [7] – 1b = FRU Operational State M7 - Communication Lost [6] – 1b = FRU Operational State M6 - FRU Deactivation In Progress [5] – 1b = FRU Operational State M5 - FRU Deactivation Request [4] – 1b = FRU Operational State M4 - FRU Active [3] – 1b = FRU Operational State M3 - FRU Activation in Progress [2] – 1b = FRU Operational State M2 - FRU Activation Request [1] – 1b = FRU Operational State M1 - FRU Inactive [0] – 1b = FRU Operational State M0 - FRU Not Installed
	(5)	[7:0] – Optional/Reserved. If provided, write as 80h (IPMI restriction). Ignore on read.

Get Sensor Reading (Physical IPMB-0 Sensor)

	Byte	Data Field
Request data	1	Sensor Number (FFh = reserved)
Response data	1	Completion Code
	2	[7] – IPMB B Override State 0b = Override state, bus isolated 1b = Local Control state - IPM Controller determines state of bus. [6:4] = IPMB B Local Status 0h = No Failure. Bus enabled if no override in effect. 1h = Unable to drive clock HI 2h = Unable to drive data HI 3h = Unable to drive clock LO 4h = Unable to drive data LO 5h = Clock low timeout 6h = Under test (the IPM Controller is attempting to determine if it is causing a bus hang). 7h = Undiagnosed Communications Failure [3] – IPMB A Override State 0b = Override state, bus isolated 1b = Local Control state - IPM Controller determines state of bus. [2:0] = IPMB A Local Status 0h = No failure. Bus enabled if no override in effect.

	Byte	Data Field
		1h = Unable to drive clock HI 2h = Unable to drive data HI 3h = Unable to drive clock LO 4h = Unable to drive data LO 5h = Clock low timeout 6h = Under test (the IPM Controller is attempting to determine if it is causing a bus hang). 7h = Undiagnosed Communications Failure
	3	Standard IPMI byte (see “Get Sensor Reading” in IPMI specification) [7] – 0b = All Event Messages disabled from this sensor [6] – 0b = Sensor scanning disabled [5] – 1b = Initial update in progress. This bit is set to indicate that a “Re-arm Sensor Events” or “Set Event Receiver” command has been used to request an update of the sensor status, and that update has not occurred yet. Software should use this bit to avoid getting an incorrect status while the first sensor update is in progress. This bit is only required if it is possible for the controller to receive and process a “Get Sensor Reading” or “Get Sensor Event Status” command for the sensor before the update has completed. This is most likely to be the case for sensors, such as fan RPM sensors, that may require seconds to accumulate the first reading after a re-arm. [4:0] – Reserved. Ignore on read.
	4	[7:4] – Reserved. Write as 0h, ignore on read [3] 1b = IPMB A enabled, IPMB-B enabled [2] 1b = IPMB A disabled, IPMB-B enabled [1] 1b = IPMB-A enabled, IPMB-B disabled [0] 1b = IPMB A disabled, IPMB-B disabled
	(5)	[7:0] – Optional/Reserved. If provided, write as 80h (IPMI restriction). Ignore on read.

Watchdog Timer Sensor

Sensor Type	Sensor Type Code	Sensor Specific Offset	Event
Watchdog 2	23h		This sensor is recommended for new IPMI v1.0 and later implementations.
			Timer expired, status only (no action, no interrupt)
		00h	Hard Reset
		01h	Power Down
		02h	Power Cycle
		03h	reserved
		04h-07h	Timer interrupt
		08h	The Event Data 2 field for this command can be used to provide an event extension code, with the following definition: 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

Sensor Type	Sensor Type Code	Sensor Specific Offset	Event
			2h = BIOS/POST 3h = OS Load 4h = SMS/OS 5h = OEM Fh = unspecified all other = reserved

Version Change Sensor

Sensor Type	Sensor Type Code	Sensor Specific Offset	Event
Version Change	2Bh	00h	00h Intelligent change detected with associated Entity. Informational. This offset does not imply whether the intelligent change was successful or not. Only that a change occurred.
		01h	01h Firmware or software change detected with associated Entity.Informational. Success or failure not implied.
		02h	02h Intelligent incompatibility detected with associated Entity.
		03h	03h Firmware or software incompatibility detected with associated Entity.
		04h	04h Entity is of an invalid or unsupported intelligent version.
		05h	05h Entity contains an invalid or unsupported firmware or software version.
		06h	06h Intelligent Change detected with associated Entity was successful. (deassertion event means unsuccessful').
		07h	07h Software or F/W Change detected with associated Entity was successful. (deassertion event means 'unsuccessful') *Event data 2 can be used for additional event information on the type of version change, with the following definition:* Event Data 2 7:0 Version change type 00h unspecified 01h management controller device ID (change in one or more fields from 'Get Device ID') 02h management controller firmware revision 03h management controller device revision 04h management controller manufacturer ID 05h management controller IPMI version 06h management controller auxiliary firmware ID 07h management controller firmware boot block 08h other management controller firmware 09h system firmware (EFI / BIOS) change 0Ah SMBIOS change 0Bh operating system change 0Ch operating system loader change 0Dh service or diagnostic partition change 0Eh management software agent change 0Fh management software application change 10h management software middleware change 11h programmable intelligent change (e.g. FPGA) 12h board/FRU module change (change of a module plugged into associated entity) 13h board/FRU component change (addition or removal of a replaceable

Sensor Type	Sensor Type Code	Sensor Specific Offset	Event
			component on the board/FRU that is not tracked as a FRU) 14h board/FRU replaced with equivalent version 15h board/FRU replaced with newer version 16h board/FRU replaced with older version 17h board/FRU intelligent configuration change (e.g. strap, jumper, cable change, etc.)

Get Sensor Reading Command

	Byte	Data field
Request data	1	Sensor Number (FFh = reserved)
Response data	1	Completion Code
	2	Sensor reading Byte 1: byte of reading. Ignore on read if sensor does not return an numeric (analog) reading.
	3	[7] - 0b = All Event Messages disabled from this sensor [6] - 0b = sensor scanning disabled [5] - 1b = reading/state unavailable (formerly "initial update in progress"). This bit is set to indicate that a 're-arm' or 'Set Event Receiver' command has been used to request an update of the sensor status, and that update has not occurred yet. Software should use this bit to avoid getting an incorrect status while the first sensor update is in progress. This bit is only required if it is possible for the controller to receive and process a 'Get Sensor Reading' or 'Get Sensor Event Status' command for the sensor before the update has completed. This is most likely to be the case for sensors, such as fan RPM sensors, that may require seconds to accumulate the first reading after a re-arm. The bit is also used to indicate when a reading/state is unavailable because the management controller cannot obtain a valid reading or state for the monitored entity, typically because the entity is not present. For more in formation, please see *Section 16.4, Event Status, Even Conditions, and Present State* and *Section 16.6, Re-arming* on the PICMG specification 3.0. [4:0] - reserved. Ignore on read.
	4	For threshold-based sensors Present threshold comparison status [7:6] - reserved. Returned as 1b. Ignore on read. [5] - 1b = at or above (≥) upper non-recoverable threshold [4] - 1b = at or above (≥) upper critical threshold [3] - 1b = at or above (≥) upper non-critical threshold [2] - 1b = at or below (≤) lower non-recoverable threshold [1] - 1b = at or below (≤) lower critical threshold [0] - 1b = at or below (≤) lower non-critical threshold For discrete reading sensors [7] - 1b = state 7 asserted [6] - 1b = state 6 asserted [5] - 1b = state 5 asserted [4] - 1b = state 4 asserted [3] - 1b = state 3 asserted [2] - 1b = state 2 asserted [1] - 1b = state 1 asserted [0] - 1b = state 0 asserted
	(5)	For discrete reading sensors only. (Optional) (00h Otherwise) [7] - reserved. Returned as 1b. Ignore on read.

	Byte	Data field
		[6] - 1b = state 14 asserted [5] - 1b = state 13 asserted [4] - 1b = state 12 asserted [3] - 1b = state 11 asserted [2] - 1b = state 10 asserted [1] - 1b = state 9 asserted [0] - 1b = state 8 asserted

8.3.4 FRU Information

The FRU (Field Replaceable Unit) information includes Board information, product information, and board E-key information.

Board information area

Board Info Area	Field Data
Mfg. Date / Time	Programmed with manufacturing date
Board Manufacturer	ADLINK Technology
Board Product Name	aTCA-3430
Board Serial Number	Programmed with serial number
Board Part Number	aTCA-3430

Product information area

Product Info Area	Field Data
Manufacturer Name	ADLINK Technology
Product Name	aTCA-3430
Product Part/Model Number	aTCA-3430
Product Version	Programmed with Product Version
Product Serial Number	Programmed with serial number
FRU File ID	FRU version

Board E-key Information

The board E-keying information is compatible with PICMG 3.0 R3.0 and PICMG 3.1 R2.0.

Base Channel of Board Point-to-Point Connectivity:

Field	Field Data
Link Descriptor	00001101h ~ 0000110Eh
Link Grouping ID (Bits 31-24)	00h: Single-channel link
Link Type Extension (Bits 23-20)	0h: None
Link Type (Bits 19-12)	01h: PICMG 3.0 Base Interface 10/100/1000 BASE-T
Link Designator (Bits 11-0)	101h~10Eh: Base Interface, Channel 1 ~ Channel 14, Port 0

Fabric Channel of Board Point-to-Point Connectivity:

Field	Field Data
Link Descriptor	00132F41h ~ 00132F4Dh
Link Grouping ID (Bits 31-24)	00h: Single-channel link
Link Type Extension (Bits 23-20)	1h: Fixed 40GBASE-KR4
Link Class (bits 19-16)	3h: 10.3125Gbd Signaling Link Class
Link Type (Bits 15-12)	2h: PICMG 3.1 Ethernet Fabric Interface
Link Designator (Bits 11-0)	F41h ~ F4Dh: Fabric Interface, Channel 1 ~ Channel 13, Port 0, 1, 2, 3
Link Descriptor	00032F41h ~ 00032F4Dh
Link Grouping ID (Bits 31-24)	00h: Single-channel link
Link Type Extension (Bits 23-20)	0h: Fixed 10GBASE-KR
Link Class (bits 19-16)	3h: 10.3125Gbd Signaling Link Class
Link Type (Bits 15-12)	2h: PICMG 3.1 Ethernet Fabric Interface
Link Designator (Bits 11-0)	F41h ~ F4Dh: Fabric Interface, Channel 1 ~ Channel 13, Port 0, 1, 2, 3
Link Descriptor	00032141h ~ 0003214Dh
Link Grouping ID (Bits 31-24)	00h: Single-channel link
Link Type Extension (Bits 23-20)	0h: Fixed 10GBASE-KR
Link Class (bits 19-16)	3h: 10.3125Gbd Signaling Link Class
Link Type (Bits 15-12)	2h: PICMG 3.1 Ethernet Fabric Interface
Link Designator (Bits 11-0)	141h ~ 14Dh: Fabric Interface, Channel 1~ Channel 13, Port 0
Link Descriptor	00102F41h ~ 00102F4Dh
Link Grouping ID (Bits 31-24)	00h: Single-channel link

Field	Field Data
Link Type Extension (Bits 23-20)	1h: Fixed 10GBASE-BX4 (XAUI)
Link Class (bits 19-16)	0h: Basic signaling Link Class
Link Type (Bits 15-12)	2h: PICMG 3.1 Ethernet Fabric Interface
Link Designator (Bits 11-0)	F41h ~ F4Dh: Fabric Interface, Channel 1 ~ Channel 13, Port 0, 1, 2, 3
Link Descriptor	00002F41h ~ 00002F4Dh
Link Grouping ID (Bits 31-24)	00h: Single-channel link
Link Type Extension (Bits 23-20)	0h: Fixed 1000BASE-BX
Link Class (bits 19-16)	0h: Basic signaling Link Class
Link Type (Bits 15-12)	2h: PICMG 3.1 Ethernet Fabric Interface
Link Designator (Bits 11-0)	F41h ~ F4Dh: Fabric Interface, Channel 1 ~ Channel 13, Port 0, 1, 2, 3
Link Descriptor	00002141h ~ 0000214Dh
Link Grouping ID (Bits 31-24)	00h: Single-channel link
Link Type Extension (Bits 23-20)	0h: Fixed 1000BASE-BX
Link Class (bits 19-16)	0h: Basic signaling Link Class
Link Type (Bits 15-12)	2h: PICMG 3.1 Ethernet Fabric Interface
Link Designator (Bits 11-0)	141h ~ 14Dh: Fabric Interface, Channel 1 ~ Channel 13, Port 0

8.3.5 IPMI Commands

The following table presents all the commands which are supported by the aTCA-3430 through different interfaces and compatible with IPMI v1.5 and PICMG 3.0 R2.0 ECN001. There are two interfaces implemented with IPMI command support: (1) PI: Payload serial interface; (2) IPMB0: IPMBA & IPMBB.

	PI	IPMB0
IPMI Commands		
IPM Device "Global" Commands		
Get Device ID	●	●
Cold Reset	●	●
Warm Reset	●	●
Get Self Test Results	●	●
Get Device GUID	●	●
IPMI Messaging Support Commands		
Set BMC Global Enables	●	●
Get BMC Global Enables	●	●
Clear Message Flags	●	●
Get Message Flags	●	●
Get Message	●	●
Send Message	●	●
Master Write-Read	●	●
BMC Watchdog Timer		
Reset Watchdog Timer	●	●
Set Watchdog Timer	●	●
Get Watchdog Timer	●	●
Event Commands		
Set Event Receiver	●	●
Get Event Receiver	●	●
Platform Event	●	●
Sensor Device Commands		
Get Device SDR Info	●	●
Get Device SDR	●	●
Reserve Device SDR Repository	●	●
Get Sensor Reading Factors	●	●
Set Sensor Hysteresis	●	●
Get Sensor Hysteresis	●	●
Set Sensor Threshold	●	●
Get Sensor Threshold	●	●
Set Sensor Event Enable	●	●
Get Sensor Event Enable	●	●

Sensor Device Commands (cont'd)		
Rearm Sensor Events	●	●
Get Sensor Event Status	●	●
Get Sensor Reading	●	●
FRU Device Commands		
Get FRU Inventory Area Info	●	●
Read FRU Data	●	●
Write FRU Data	●	●
PICMG Command		
HPM.1 Upgrade Commands (HPM.1)		
Get target upgrade capabilities	●	●
Get component properties	●	●
Abort Firmware Upgrade	●	●
Initiate upgrade action	●	●
Upload firmware block	●	●
Finish firmware upload	●	●
Get upgrade status	●	●
Activate firmware	●	●
Query Self-test Results	●	●
Query Rollback status	●	●
Initiate Manual Rollback	●	●
AdvancedTCA		
Get PICMG Properties	●	●
Get Address Info	●	●
FRU Control	●	●
FRU Control Capabilities	●	●
Get FRU LED Properties	●	●
Get LED Color Capabilities	●	●
Set FRU LED State	●	●
Get FRU LED State	●	●
Set IPMB State		●
Set FRU Activation Policy	●	●
Get FRU Activation Policy	●	●
Set FRU Activation	●	●
Get Device Locator Record ID	●	●
Get Port State	●	●
Set Port State		●
Compute Power Properties		●
Set Power Level	●	●
Get Power Level	●	●
Bused Resource Control		●
Get IPMB Link Info	●	●

9. Software Component Overview

This chapter describes the top level of software design of the aTCA-3430.

The aTCA-3430 software can be logically divided into four subsystems as shown in Figure 14. This chapter will cover the IPMI subsystem, LMP subsystem, and switch subsystem. The remaining subsystem is the customer software, which can be a user add-on L2/L3 stack, or the upper level user interface/application.

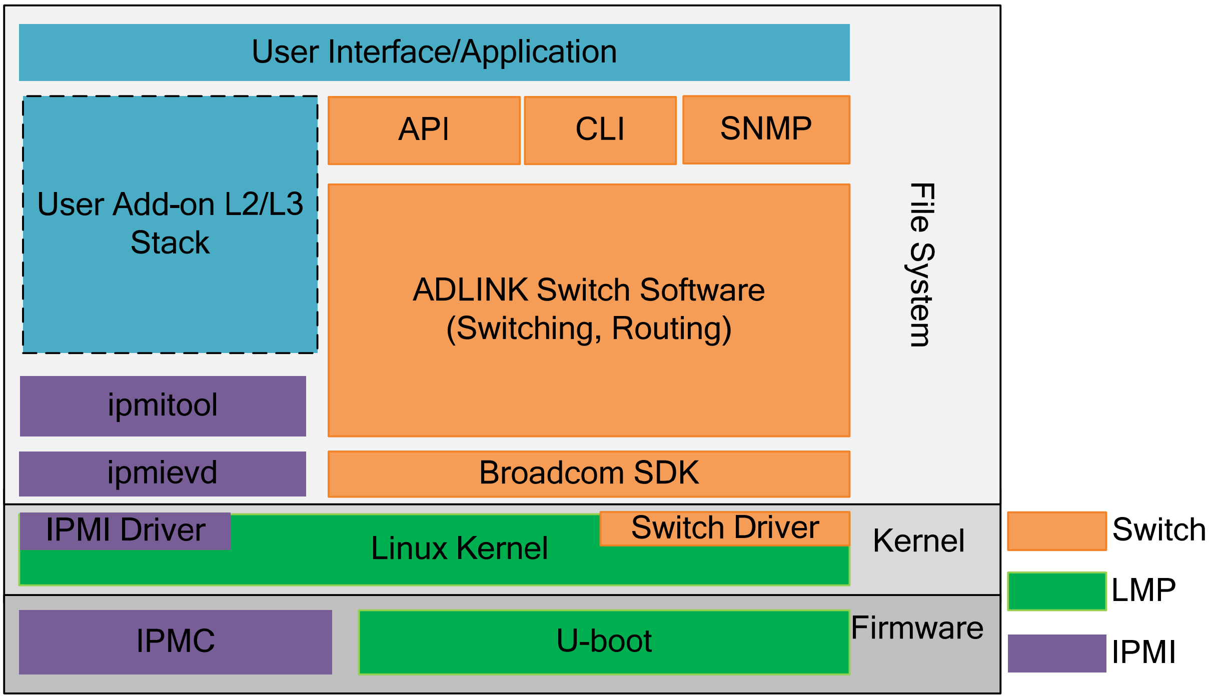


Figure 14. aTCA-3430 Software Overview

9.1 IPMI Subsystem

The Intelligent Platform Management Interface (IPMI) is a part of the ATCA standard for controlling intelligent devices that monitor a system. It enables dynamic discovery of sensors in the system and the ability to monitor the sensors and to be informed when the sensor's values change or go beyond the predefined boundaries. It also has a standardized database for field-replaceable units (FRUs) and a watchdog timer. The IPMI subsystem includes IPMC, kernel driver and userland applications. The IPMC side is a Pigeon Point SmartFusion implementation. The system interface between the LMP and the IPMC is implemented by a UART interface. The native Linux IPMI driver needs to be patched to support the UART-based serial interface. On the LMP side, ipmitool is used to send IPMI requests and receive IPMI responses from the IPMC, and ipmievd is used to listen to sensor events generated and reported by the IPMC firmware.

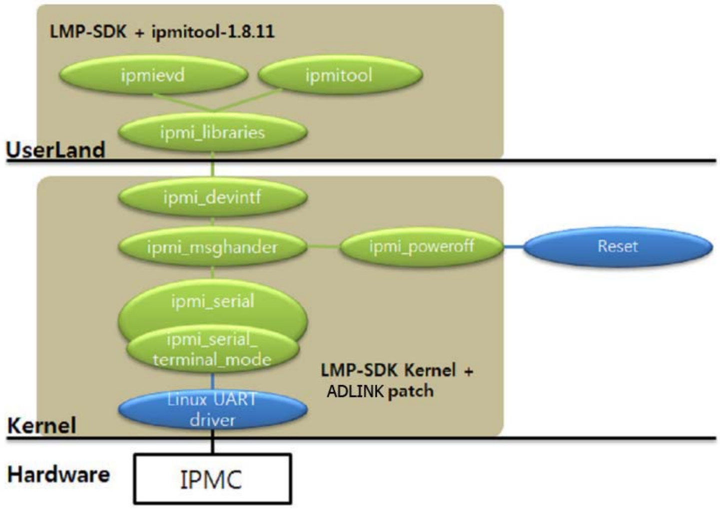


Figure 15. IPMI Function Blocks

9.2 LMP Subsystem

The LMP subsystem includes the U-Boot based boot loader, Linux kernel and file system porting. The LMP subsystem development is based on an LMP-SDK provided by Freescale (LMP processor provider). After installation, the LMP-SDK will create the necessary build tool chains for BSP development, and it will also generate the initial U-Boot, kernel and file system. ADLINK will make BSP development and create patches to make Linux work smoothly on the aTCA-3430.

9.3 Switch Subsystem

The switch subsystem includes Broadcom SDK configuration/porting and user-space switch software. The Broadcom SDK is a part of the LMP software suite. Shown in Figure 16 are the Broadcom switch S/W package components which are associated with the two onboard switches, the BCM56842/BCM56846 Fabric switch and the BCM56334 Base switch. The configuration interfaces are PCIe for BCM56842/BCM56846 and BCM56334. Both interfaces are connected to the LMP.

bcm.user is a user interface shell program which can be accessed to configure the switches. The kernel modules *linux_user_bde.ko*, and *linux_kernel_bde.ko* simply provide switch hardware access points and most of the functionalities are provided by *bcm.user*. The aTCA-3430 S/W package provides the user mode BCM-SDK only. The kernel mode BCM-SDK, where most of the functionalities are included in the kernel with bcm.user for a simple user interface, is not supported on the aTCA-3430. Under default settings, the system will boot to the BCM SDK shell.

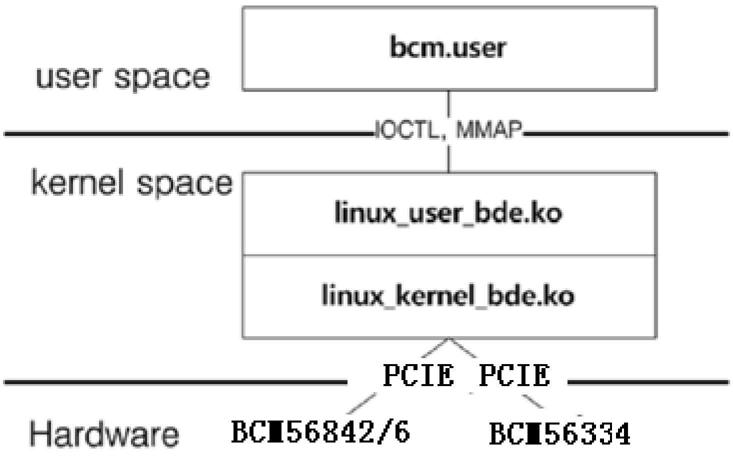


Figure 16. Broadcom SDK Function Blocks

9.4 PacketManager

ADLINK PacketManager is designed to support ADLINK hardware platforms, boosting packet processing performance on all platforms, including AdvancedTCA and CompactPCI. PacketManager features are divided into those for the control plane and the data plane. The control plane runs on the switch chipset, such as Broadcom's BCMxxxxx series. The data plane is runs on the central processor, such as an x86 and MIPS chipset. With the ADLINK PacketManager, customers can easily deploy their own applications on ADLINK hardware platforms, speeding up the development process and reducing time-to-market.

9.4.1 Features List

The main PacketManager control plane features are as follows.

- **Port Manager:** port configuration, port status, port statistics
- **Manual Trunk:** enhanced trunk hash (MAC, 5-tuple)), load balancing, trunk monitoring
- **VLAN Manager.:** VLAN configuration, VLAN status, double VLAN, VLAN interface
- **STP Protocol:** standard 802.1D STP protocol
- **LACP:** standard IEEE802.3ad Link Aggregation Control Protocol.
- **IGMP:** IGMP V1/V2, IGMP proxy, IGMP snooping
- **Route:** static routing, VLAN-based routing, dynamic routing protocols (OSPF, RIP, BGP, OSPFv3, RIPng, BGP4+), supports IPv4 and IPv6
- **CLI:** Cisco-style CLI supporting remote login, automatic completion, real-time help
- **API:** C Language API supporting remote process call (with documentation and examples)

Please refer to the PacketManager Programmer's Guide and Configuration Guide for detailed documentation.

Safety

1. Please read these safety instructions carefully.
2. Please keep this User‘s Manual for future reference.
3. When installing/mounting or uninstalling/removing equipment, turn off power and unplug any power cords/cables. Use a moist towel or cloth for cleaning.
4. For pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.
5. Please keep this equipment from humidity.
6. Lay this equipment on a stable surface when installing. A drop or fall could cause injury.
7. Make sure to use recommended voltage and power source settings when connect the equipment to the power outlet.
8. Place the power cord such a way that people cannot step on it. Do not place anything over the power cord.
9. All cautions and warnings on the equipment should be noted.
10. If the equipment is not used for an extended period of time, disconnect the equipment from its power source to avoid being damaged by transient overvoltage.
11. Never pour any liquid into openings; this could cause fire or electrical shock.
12. Never attempt to fix the equipment. For safety reasons, the equipment should only be serviced by qualified personnel.
13. If one of the following situations arises, get the equipment checked by an authorized technician:
    a. The Power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment has not work well or you can not get it work according to user‘s manual.
    e. The equipment has dropped and damaged.
    f. If the equipment has obvious sign of breakage.

Consignes de Sécurité

1. Veuillez lire attentivement ces consignes de sécurité.
2. Veuillez garder ce manuel de l’utilisateur pour référence ultérieure.
3. Une entrée de courant est fournie pour l’entretien de l’appareil débranché. Débrancher l’appareil des prises de courant et utiliser cette entrée de courant avant entretien ou nettoyage. Utilisez un tissu humide ou un chiffon pour le nettoyage.
4. Pour les appareils raccordés, la prise de courant doit être installée près de l’appareil et doit être facilement accessible.
5. Ne pas exposer les appareils à l’humidité.
6. Posez ces appareils sur une surface stable pour les installer. Une chute peut provoquer des blessures.
7. Vérifiez la tension de la source d’alimentation lorsque vous branchez l’appareil à la prise de courant.
8. Placez le cordon d’alimentation de telle manière que personne ne puisse marcher dessus. Ne rien placer sur le cordon d’alimentation.
9. Tous les avertissements concernant ces appareils doivent être respectés.
10. Si un appareil n’est pas utilisé pendant longtemps, débranchez-le du réseau électrique pour éviter qu’il soit endommagé par une surtension.
11. Ne jamais verser de liquide dans les ouvertures, cela pourrait provoquer un incendie ou une décharge électrique.
12. Ne jamais ouvrir l’appareil. Pour des raisons de sécurité, l’appareil ne doit être ouvert que par un personnel qualifié.
13. Si l’une des situations suivantes se présente, faites vérifier l’appareil par le personnel de service:
    a. Le cordon d’alimentation ou la prise sont endommagés.
    b. Du liquide est entré dans l’appareil.
    c. L’appareil a pris l’humidité.
    d. L’appareil ne fonctionne pas bien ou vous ne pouvez pas le faire fonctionner conformément au manuel de l’utilisateur.
    e. L’appareil est tombé et est endommagé.
    f. L’appareil présente des signes évidents de bris.

Getting Service

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