FlexPacket ATCA PP50 Packet Processor User Manual

CC06786-11B

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Printed in U.S.A.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The user manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

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Introduction

This manual provides instructions for installing and using Continuous Computing's FlexPacket PP50 (PP50) high-performance packet processing blade.

The PP50 provides deep-packet inspection capabilities that support advanced content-aware routing and security functions required by multi-service IP networks. The blade is for next-generation infrastructure applications, including IPTV, radio network controllers (RNC), security gateways, session border controllers, WiMAX base station aggregation, and wireless xGSNs.

The PP50 includes one or two discrete multi-core MIPS64 packet processors. Each processor provides 8 multi-threaded cores and contains a built-in security coprocessor capable of handling up to 10Gbps of bulk encryption/decryption (20Gbps per blade).

Each processor with up to 8Gb of memory (16Gb per blade), as well as access to a TCAM and content-based processors via mezzanines. TCAM is especially important for very high performance IPv6 routing platforms. For a list of orderable configurations, accessories and their part numbers please see Section 1.1.4, "Accessories" for more information.

The PP50 interconnects the processors, I/O, and backplane fabrics using a non-blocking 10 Gigabit Ethernet (10GbE) switch. Each XLR processor has two 10GbE ports to the switch, providing full duplex 10GbE capabilities. External I/O is supported over a dual redundant 10GbE backplane fabric (PICMG 3.1.9). Direct connection to 10GbE and 1GbE ports on the front or rear supports specific cabling requirements.

When used with Continuous Computing's FlexTCA systems and software, the PP50 provides the fastest path from application development to deployment revenue. From IPTV to Wireless Core Networks, the PP50 can deploy a wide range of high performance, scalable telecom applications.

1.1 Part Numbers and Options

1.1.1 Part Numbers

Part numbers below are the standard Continuous Computing part numbers. Customer-specific configurations may be assigned a unique part number.

Table 1-1: PP50 and Accessory Part Numbers

Description	Part #
PP50 Boards	
PP50, baseboard, dual 1GHz XLR732, four 1-GB 667 MHz memory	0-11126
PP50, baseboard, dual 1GHz XLR732, four 2-GB 667MHz memory	0-11127
Adapter Cable for Development	
DB9 to micro-DB9 adapter cable used for development (6 feet). See Section 4.1, "Serial Console Access" for details.	5-02138
PP50 Rear Transition Module	
RTM, Ten 1GbE and two 10GbE (SFP/SFP+ cages only, excludes modules). Only compatible with PP50	0-11024
SFP/SFP+ Modules (for both FM40 and PP50)	
Optical 10GbE 850nm SFP+ SR transceiver with “Limiting” receiver output signal.	5-02491
Optical 1GbE/2GbE, SFP-SX, 850nm, 550m reach, Ethernet/FC	5-02515
Copper SFP, 1000Base-T	5-02673
1.25/1.0625Gbps SFP 1310nm Fp Transceiver, Hot Pluggable	5-02714
10G SFP+ 1310nm Limiting, Hot Pluggable	5-02784
PP50 TCAM Mezzanines	
PP50, 36 Mbit TCAM mezzanine	0-11760
PP50, 72 Mbit TCAM mezzanine	0-11761

1.1.2 Basic Configurations

The PP50 is shipped in the following configurations.

- 2G per XLR
- 4G per XLR
- 8G per XLR

All use 667MHz DRAM.

1.1.3 RTM

One RTM works for all configurations. It supports two 10GbE and ten 1GbE ports. It does not include SFP or SFP+ modules as standard.

1.1.4 Accessories

An optional TCAM mezzanine may be factory installed. Two sizes are offered:

- 36Mbit
- 72Mbit

SFP or SFP+ modules can be ordered as required and they will be pre-integrated

Special serial cables (hydra cables) used for development are also available as a separate line item. See Section 4.3.1, "Development Adapter (Hydra) Cable" for more information about the cables.

1.2 Glossary

The following table lists definitions for acronyms used in this document.

Table 1-2: Terms Used in this Document

Term	Definition
SHMC	A software package for acting as a Shelf Manager
10GbE	Ten Gigabit Ethernet
1GbE	One Gigabit Ethernet
BSWITCH	Base Switch
CNODE	The PPC 405+FPGA+FLASH+switch with whatever software packages are running on it
CPLD	Complex Programmable Logic Device
DDR2	Double Data Rate 2 (memory interface)
DHCP	Dynamic Host Configuration Protocol
DIMM	Dual In-Line Memory Module
FIFO	First In First Out
FSWITCH	Fabric Switch
I2C, IIC or I2C	Inter-IC Bus
IMS	IP Multimedia Subsystem
IPMB	Intelligent Platform Management Bus
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
JTAG	Joint Test Action Group
NSE	Network Search Engine
NFS	Network File System
QDR	Quad Data Rate
RAM	Random Access Memory
RMCP	Remote Management Control Protocol
ROM	Read Only Memory
RTM	Rear Transition Module
SCL	I2C Bus Serial Clock

Table 1-2: Terms Used in this Document

Term	Definition
TCA	Telecommunications Computing Architecture
TCAM	Ternary Content Addressable Memory
TFTP	Trivial File Transfer Protocol
UART	Universal Asynchronous Receiver Transmitter
VFAT	Linux file system that is compatible with Windows FAT
XLR	RMI's multi-core CPU

Notations

This table displays the notations used in this document:

Notation	Explanation	Examples
Arial	Titles	1.1 Title
Book Antiqua	Body text	This is body text.
Bold	**Highlights information**	**Loose coupling, tight coupling, upper layer interface**
Italics	Document names, emphasis	*FlexPacket ATCA PP50 Packet Processor* This *must* be installed.

Command line input and output, and code is indicated by Courier New type and a blue background as shown below.

```
PP50-1 $ iobus
IOBus Devices:
BaseAddr        Size(KB)        ChipSel Device
==============================================================================
0xbc000000       16384            0     cfiflash_0
```

Also note this document uses PDF page numbering compared to traditional number schemes.

1.3 Additional Documentation

This manual assumes you are familiar with the following documentation from RMI.

- RMI SDK Software Developer's Guide (referred to as “the RMI SDK Guide” in this document)
- XLR Processor Family Programming Reference Manual
- TCAM User Manual (PN CC07478)

This document does not cover topics discussed in the above documents unless the information is different for the PP50 platform.

You may also find it necessary to reference the MIPS 64 Architecture manuals, available for download from www.mips.org.

Finally, this manual assumes basic familiarity with setting up DHCP, TFTP, and NFS servers, building Linux kernels, installing RPMs and tarballs, and using cross-compile tool chains.

2

Technical Overview

This chapter describes PP50 main features and gives an overview of the hardware and software.

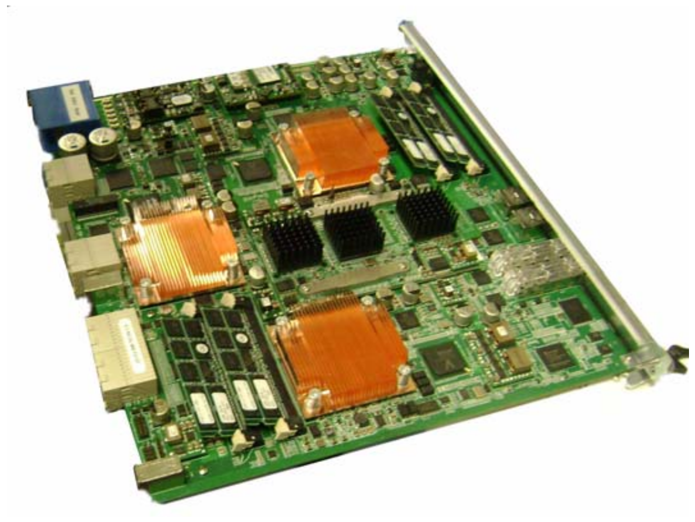

Figure 2-1: PP50 Overview Photo

2.1 Main Features

The PP50's major subsystems are described in this section.

2.1.1 RMI Processor Subsystem

The RMI processor subsystem includes dual RMI XLR7xx BGA1605 CPU sites; a PP50 can support any CPU in any of those families with the proper assembly changes. See Section 2.2.5, "RMI Processor CPU Subsystem" for processor subsystem details.

The RMI XLR processors support up to eight MIPS 64 bit RISC cores, each having 4 individual execution threads for a total of 32 execution threads.

See Table 2-1 "RMI XLR Family Configurations" for a reduced feature parts as list for this processor family.

The PP50 supports reduced configurations based on these parts, but the default configuration is two XLR732s fully populated devices.

2.1.2 Ethernet Switch Module

FM2112/FM3112 (Fulcrum Microelectronics) Ethernet switch module, described in detail in Section 2.2.6, "Fabric and Base Switch Modules". The onboard fabric Ethernet and base Ethernet switches facilitate connectivity. The fabric switch is a layer 2 device that provides 10GbE connectivity for the CPUs as well as multiple 1GbE data paths. The base switch facilitates communication between the two XLR CPUs, IPMC controller and two base interfaces.

2.1.3 RTM Interface

The PP50 supports a rear transition module (RTM) that includes a protected power supply, a management interface to the IPMC, ten 1GbE interfaces and two 10GbE interfaces.

2.2 Hardware Overview

2.2.1 Front Panel Ports

- **10GE.1**: SFP+ port (IEEE 802.3 10GBASE-X)
- 10GE.2: SFP+ port (IEEE 802.3 10GBASE-X)
- CPU.1: RJ45 Connector to XLR 0
- CPU.2: RJ45 Connector to XLR 1

See Section 2.2.10.1, "LEDs"for a description the LED indicators.

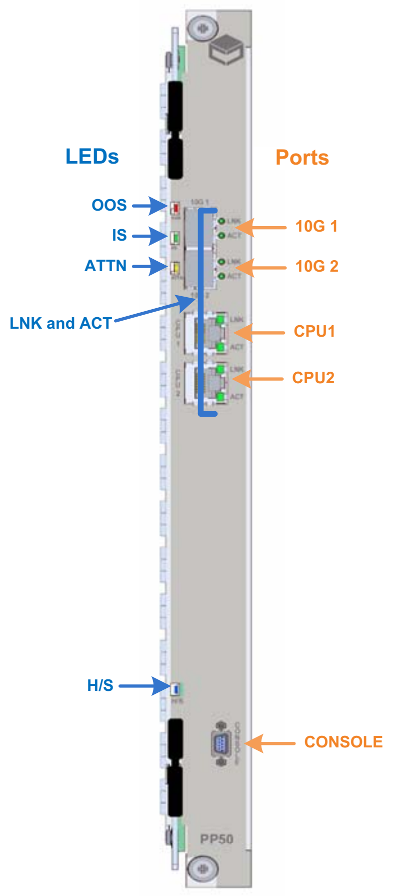

Figure 2-2: Front Panel

2.2.2 Backplane Interface

The PP50 is designed as a node board in an ATCA system. Its backplane interface is compatible with the PICMG3.0 R2.0 specification.

2.2.3 Connectors

2.2.3.1 Internal Connectors

J15 - XLR CPU 2 Memory Channel AB Mini-DIMM Connector

J17 - XLR CPU 2 Memory Channel CD Mini-DIMM Connector

J18 - XLR CPU 1 Memory Channel AB Mini-DIMM Connector

J21 - XLR CPU 1 Memory Channel CD Mini-DIMM Connector

J52 - XLR CPU 2 CF card connector

J53 - XLR CPU 1 CF card connector

J54 - Extended JTAG connector from JTAG CPLD

J56 - JTAG connector for JTAG CPLD

J100 - Internal Mezzanine card connector

J101 - Internal Mezzanine card connector

J102 - JTAG connector for XLR CPU 1

J103 - JTAG connector for XLR CPU 2

J110 - JTAG connector for IPMC

2.2.3.2 External Connectors

J11 - Micro-DB9 Console Port

J104 - RJ45 Connector for XLR Module 1 (XLR0)

J105 - RJ45 Connector for XLR Module 2 (XLR1)

J109 - Two 10G SFP plus Ports connector

2.2.3.3 ATCA Connectors

P10 - ATCA Zone 1 Power Connector

J20 / J23 - ATCA Zone 2 connectors

J26 / J27 - ATCA Zone 3 connectors to RTM

2.2.4 Graphical Overview

The following diagram provides a graphical overview the PP50's hardware. The zoom tool in your viewer may be used to magnify sections of interest.

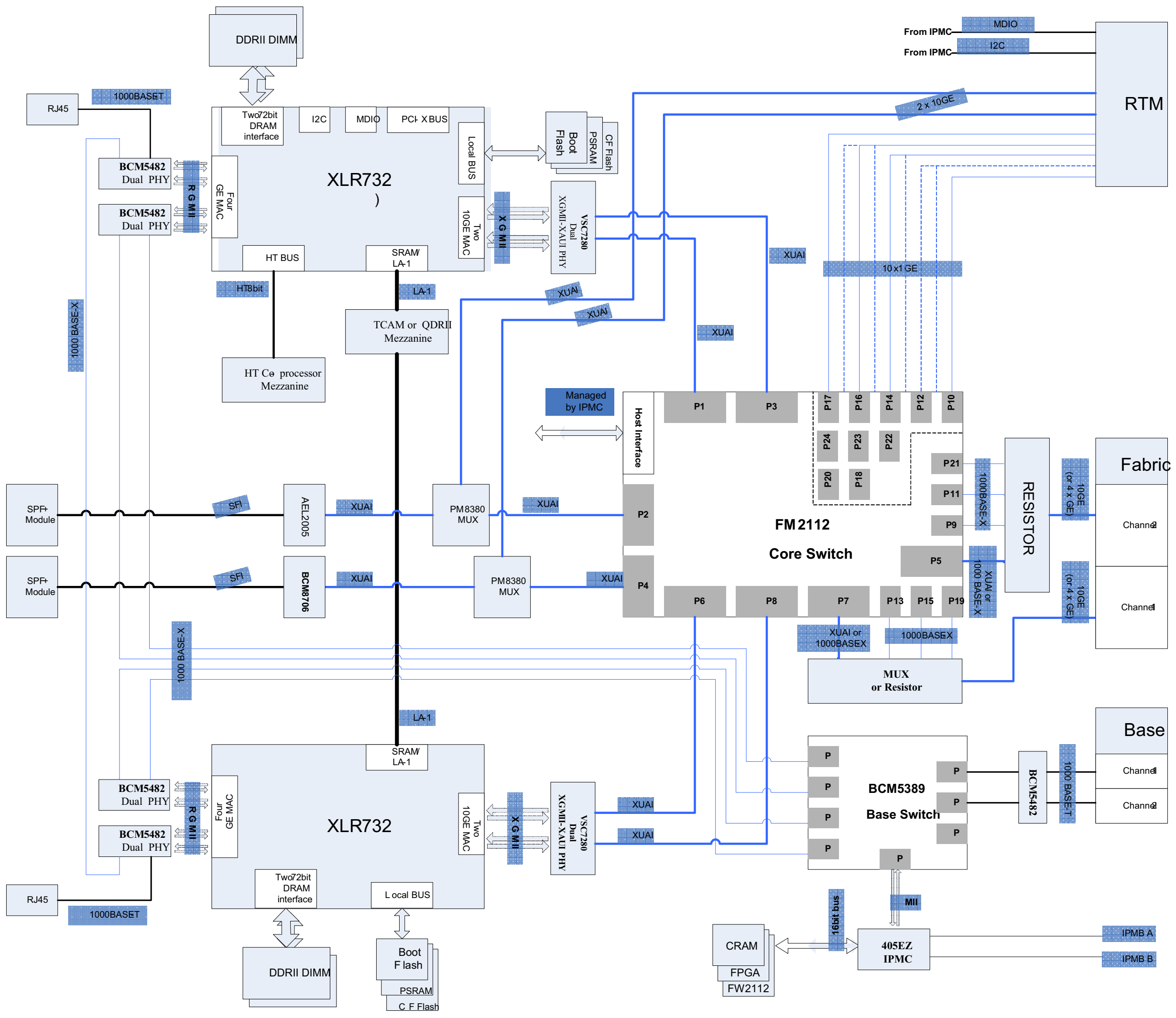

Figure 2-3: Overall Hardware Block Diagram.

The diagram below shows connections between the PP50's Base and Fabric components.

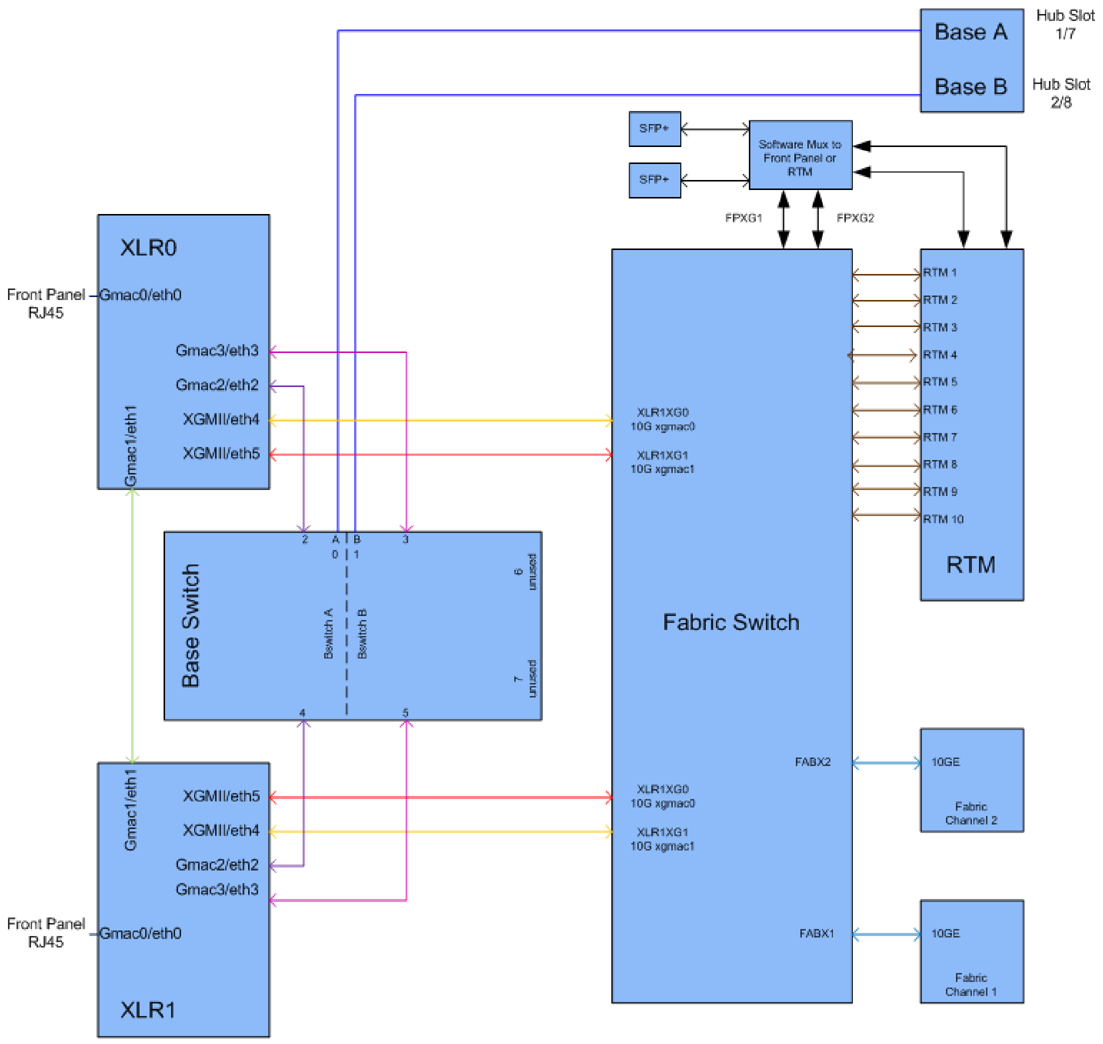

Figure 2-4: Base and Fabric Connection Diagram.

2.2.5 RMI Processor CPU Subsystem

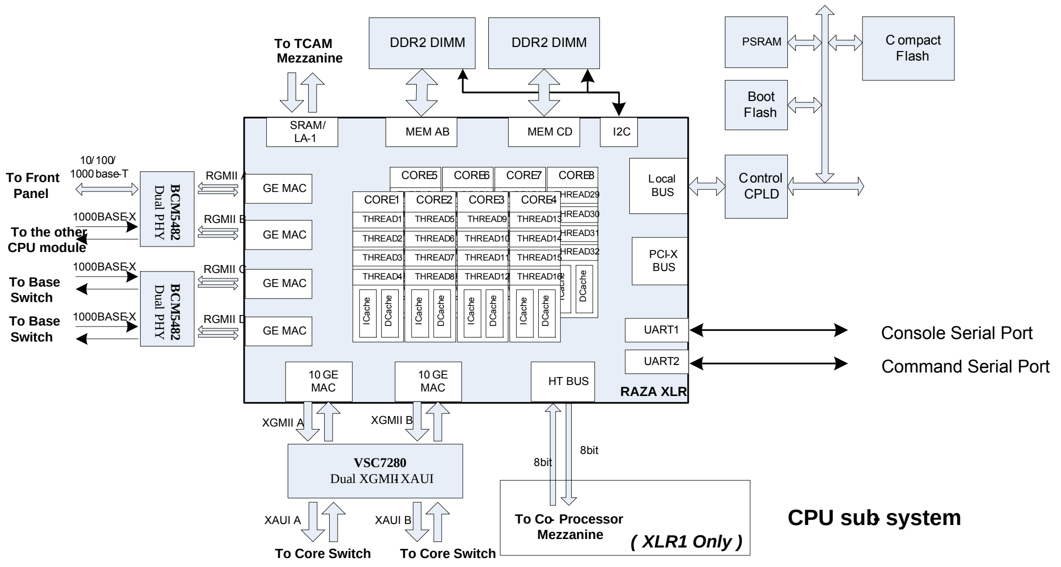

Figure 2-5: RMI Processor CPU Subsystem

The PP50 uses two XLR7xx CPU sites. They are identical, except that the XLR at site 1 can access the co-processor mezzanine through the bus. The features of the CPU subsystems are described below and shown in Figure 2-5 "RMI Processor CPU Subsystem".

- RMI XLR7xx BGA1605 CPU sites; the PP50 can support any CPU in any of those families with the proper assembly changes. They include the following XLR Family of CPUs:

Table 2-1: RMI XLR Family Configurations

Part	x32
XLR7xx	8 Cores, 32threads four 1GbE; two 10GbE

- Two 244 pin DDR2 Mini-DIMM sockets supporting standard 1.8V DDR2 Mini-DIMMs
  - One DIMM on memory channel A/B
  - One DIMM on memory channel C/D
  - Up to 800MHz DDR2 data rates
  - Up to 4GB for each DIMM

- LA-1 Interface
  - Connected to a mezzanine for TCAM add on options
- Four RGMII Gigabit Ethernet interfaces
  - One interface is routed to the front panel as the management port
  - Two interfaces are routed to the base switch
  - One interface to the other XLR through serial interface
- Two XGMII 10 Gigabit Ethernet interfaces routed to the Fabric Ethernet switch
- Local Bus / Peripheral Interface
  - 8/16/32 bit devices, 66MHz
  - Two 32M bytes FLASH for boot firmware
  - CompactFLASH socket for additional storage
  - Two 8MB PSRAM
  - Control Complex Programmable Logic Devices (CPLD)
- Two UART Ports
  - Port 1 connected to CNODE for FlexConsole
  - Port 2 connected to CNODE as a command channel
- Two I2C Ports
  - Port 1 connected to two Mini-DIMM sockets for SPD
  - Port 2 connected to a serial EEPROM

2.2.5.1 PSRAM (Flight Recorder Memory)

Each XLR subsystem on the PP50 includes PSRAM (pseudo-static DRAM). I is sometimes called flight recorder memory because it is unique in that it is not cleared or initialized during board resets/reboots, so it can be used to preserve critical state or logs across such events.

After a power cycle, the contents of the PSRAM are undefined. It is recommended that a checksum, CRC, or some other data integrity check be used on the data in the PSRAM to ensure that random powerup contents are not interpreted as valid data.

Typical uses for the PSRAM are to store routing tables, call routing information, transaction checkpoints, or log files. Having these tables available in memory can enable much faster application startup after a board reset or watchdog timeout.

Because the PSRAM is separate from main memory, neither the bootloader nor the Linux kernel will disturb its contents. Note, that the bootloader PSRAM diagnostic copies the contents to a safe area before testing the PSRAM, then copies the data back in.

To access the PSRAM from RMIOS, you can simply configure a pointer to point to the PSRAM base address and access it directly.

To access the PSRAM from user level in Linux, use the mmap system call as shown in the following code segment.

1. The start physical address and size of PSRAM on per XLR

```
PP50-1 $ iobus
IOBus Devices:
BaseAddr        Size(KB)        ChipSel Device
=============================================================================
0xbc000000       16384            0     cfiflash_0
0xb8000000       16384            3     cfiflash_1
0x19000000       16384            4     psram
0x1d000000        8192            6     pcmcia
0x1d840000          64            1     cpld
```

   Note, for PSRAM, the start address is 0x19000000, the size is 16384KB.

2. Call system API "mmap" to transform physical address to virtual address. For example:

```
volatile u16 *psram_mmap(u32 addr, u32 size)
{
    int fd=-1;
    volatile u16 *mAddr=NULL;
    if (0 > (fd = open("/dev/mem", O_RDWR|O_SYNC)))
    {
       if(debug)
       {
           printf("Open /dev/mem error!\n");
       }
       return NULL;
    }
    if (MAP_FAILED == (mAddr = mmap(NULL, size, PROT_READ|PROT_WRITE, MAP_SHARED,
fd, addr)))
    {
        if(debug)
        {
            printf("mmap /dev/mem error!\n");
        }
        close(fd);
        return NULL;
    }
    close(fd);
    return mAddr;
}
```

3. Then you can access PSRAM as same as accessing system memory.

2.2.6 Fabric and Base Switch Modules

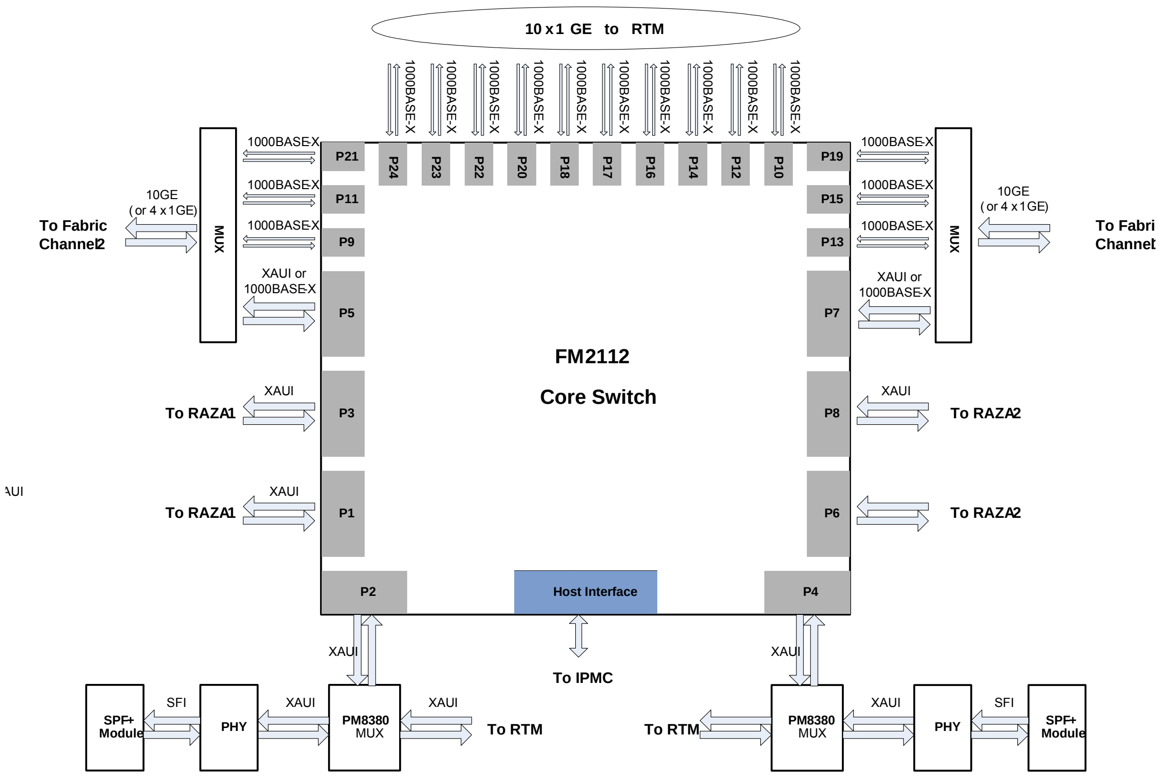

Figure 2-6: Switch Module

The Ethernet data path is facilitated by a Fulcrum FM2112/FM3112 base and fabric Ethernet switches. The FM2112/FM3112 contains eight 10GbE (4-lane) interfaces and sixteen 1GbE (1-lane) interfaces. Any of the interfaces can be operated at two speeds from two clocks, and the 4-lane ports can be operated as a single lane. The clock input assignments for the Ethernet chip are:

- REFCLK_A (1-4) is 312.5MHz for 10GbE operation
- REFCLK_B (1-4) is 125MHz for 1GbE operation

Possible operating modes for the switch are listed in Table 2-2 "Ethernet Switch Operating Modes".

Table 2-2: Ethernet Switch Operating Modes

Port	Lanes	Speed	Mode
1 – 8	4	3.125GHz	10GbE
1 – 8	1	3.125GHz	2.5GbE
1 – 8	1	1.25GHz	1GbE
9 – 24	1	1.25GHz	1GbE

The fabric interface to the AdvancedTCA backplane can be configured for 10GbE or four 1GbE operation. In 10GbE operation, Ports 7 and 5 are wired to all 4 ports in channels 1 and 2. In four 1GbE operation, Ports 7 and 5 are put in 1GbE mode and make up port [a] of the fabric interface. Switch ports [15 19 13] make up ports [b c d] for channel 1, and likewise switch ports [21 11 9] make up ports [b c d] for Fabric channel 2. The current allocation of the Fabric Ethernet ports are listed inTable 2-3 "Ethernet Switch Port Usage".

Table 2-3: Ethernet Switch Port Usage

Internal Switch Port Numbering	Port Numbering	Port Labeling	Speed	Description
1			10GbE	RAZA1
2		FP-XG1/ RTM-XG1	10GbE	Through a mux to RTM #1 or Front panel #1
3			10GbE	RAZA1 10G-B
4		FP-XG2/ RTM-XG2	10GbE	Through a mux to RTM #2 or Front panel #2
5			10GbE	Fabric Chan 2
6			10GbE	RAZA2 10G-A
7			10GbE	Fabric Chan 1
8			10GbE	RAZA2 10G-B
9			1GbE	Fabric Chan 2 Port D
10	17	RTM #3	1GbE	1GbE port
11			1GbE	Fabric Chan 2 Port C
12	18	RTM #4	1GbE	1GbE port
13			1GbE	Fabric Chan 1 Port D

Table 2-3: Ethernet Switch Port Usage

14	19	RTM #5	1GbE	1GbE port
15			1GbE	Fabric Chan 1 Port B
16	21	RTM #7	1GbE	1GbE port
17	15	RTM #1	1GbE	1GbE port

2.2.7 Optional TCAM Mezzanine

The TCAM mezzanine is an optional factory-installed add-on board. For more information about the TCAM, see the TCAM User Manual (CC07478).

2.2.8 RTM interface

The RTM is supplied with the PP50's primary 12V. The power budget for the RTM is 2.5A (30W) to support the requirement that the RTM slot support power dissipation of up to 25W.

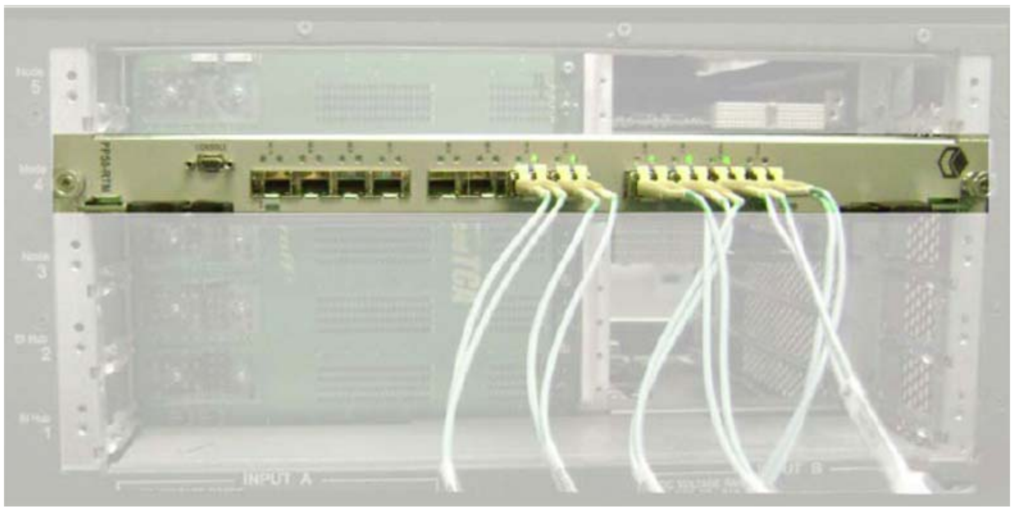

Figure 2-7: RTM interface in Chassis

The 12V is supplied through a hot swap controller that limits the current and shuts down the output upon a voltage or current fault. The controller is managed by the CNODE.

RTM interfaces provide ten 1GbE ports and two 10GbE ports, supporting the RTM options of ten SFP 1GbE ports or two 10GbE SFP+ ports. The switch configures the 1GbE ports to RTM in 1000 Base-X mode. These ports are isolated from the RTM with capacitors.

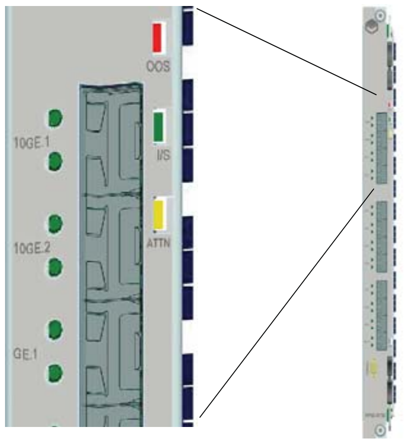

Figure 2-8: RTM Panel

The CNODE controls activation of the RTM interface. The interface is designed such that the RTM can be replaced in a running system without damage to the RTM or the front board.

The PP50 RTM supports hot swap implementation where the RTM is reported as a separate FRU, and deactivated without deactivating the front board. Only the services using the RTM are deactivated. Consult the AdvancedTCA Specification for a description of the hot swap sensor.

2.2.9 Management Subsystem

The management subsystem in an AdvancedTCA blade is a mandatory feature, required to always be on and supporting the system Intelligent Platform Management Buses (IPMB). The CNODE, implemented with a PPC405EZ Microcontroller, is required to support specific IPMI commands mandated by the AdvancedTCA Specification. Also as required by specification, the CNODE controls the state of the board (power and reset) and certain operator controls. The CNODE is required to report, in FRU records, the connectivity of the board and other requirements, such as its power needs.

Continuous Computing CNODE subsystems also provide additional core functionality for the blade. They provide a console MUX so a single RS-232 port on the front can be used to access all internal devices, as well as additional sensors for better operation of the board.

2.2.10 Front Panel

2.2.10.1 LEDs

As shown in Figure 2-9 "Front Panel LEDs", the front panel provides three working status indicator LEDs which are defined in accordance with ATCA standards as Out of Service (OOS), In Service (IS), and Attention (ATTN).

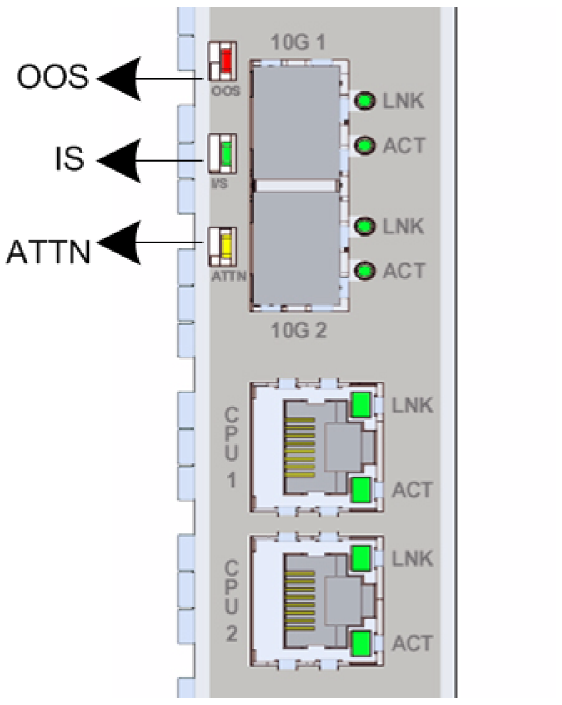

Figure 2-9: Front Panel LEDs

Once the board is inserted in a slot and the primary 12V is powered on, a blue hot swap indicator LED (HS) lights and then turns off when the board is completely inserted.

Except for the blue LED, none of the remaining three LEDs are controlled by the CNODE. Rather they are controlled by shelf manager and/or system management applications by sending the IPMI command Set FRU Led State.

The front panel provides two working status indicator LEDs to each SFP+ port and each 1GbE management port. One LED indicates link status (LINK) and the other indicates active status (ACT).

LED functions are summarized below in Table 2-4 "LED Description".

Table 2-4: LED Description

LED	Color	Description
OOS	Red	Out Of Service LED. This LED is turned ON when PP50 is powered ON and turned OFF, when the FRU enters an M1 state. After that this LED is supposed to be controlled by Shelf Manager and/or system management applications by sending the IPMI command Set FRU Led State.
IS	Green	In Service LED. This LED is turned ON when PP50 is powered ON and then turned OFF when FRU enters M1 state. After that this LED is supposed to be controlled by Shelf Manager and/or system management application by sending IPMI command Set FRU Led State.
ATTN	Yellow	An alarm LED controlled by the onboard shelf manager (if present). This LED is turned ON when PP50 is powered ON and then turned OFF when FRU enters M1 state. After that this LED is supposed to be controlled by Shelf Manager and/or system management application by sending IPMI command Set FRU Led State.
HS	Blue	HotSwap LED is controlled by IPMC as per ATCA specification. LED illuminates when it is safe to remove the board.

Table 2-4: LED Description

LED	Color	Description
10GE1 LINK	Green	10GE1 port link indicator, illuminates when well linked.
10GE1 ACT	Green	10GE1 port active indicator, illuminates when activated
10GE2 LINK	Green	10GE2 port link indicator, illuminates when well linked.
10GE2 ACT	Green	10GE2 port active indicator, illuminates when activated
XLR0 GMAC0 LINK	Green	XLR0 gmac0 port link indicator, illuminates when well linked
XLR0 GMAC0 ACT	Green	XLR0 gmac0 port active indicator, illuminates when activated
XLR1 GMAC0 LINK	Green	XLR1 gmac0 port link indicator, illuminates when well linked
XLR1 GMAC0 ACT	Green	XLR1 gmac0 port active indicator, illuminates when activated

2.2.10.2 Handle Switch

The front panel provides a handle switch to indicate whether the handle has been pressed. Whenever the press action stops, the handle switch generates a reset indicate to the CNODE.

2.2.10.3 Management Port

Each XLR processor has a RJ45 management port on the front panel.

2.2.10.4 Console Port

PP50 provides a console port to the front panel using a Micro-DB9.

2.2.10.5 10GBASE-X Port

PP50 provides two SFP+ ports at the front panel that comply with IEEE 802.3 10GBASE-X.

2.2.11 Jumpers

2.2.11.1 Default Jumper Settings

By default no jumpers are installed on the PP50.

Table 2-5: PP50 Jumper Information

Jumper	Function	Default	Settings
J28	XLR CPU 2 EEPROM Write Enable	Not Installed	• Installed: XLR EEPROM is write enabled • Not Installed: EEPROM is write protected
J29	XLR CPU 1 EEPROM Write Enable	Not Installed	
J111	Serial Mode Control 0 (S0)	Not Installed	• Use the settings for J111, J112, and J113 below to configure the serial mode. " 0" means installed, "1" means not installed The digits represent S0, S1, and S2 respectively: • 1 1 1 Default, IPMC UART's signals goes to front-panel console pins • 0 1 0 Multiplex IPMC UART, XLR0/XLR1 'console' ports on front panel • 0 0 1 Multiplex IPMC UART, XLR0/XLR1 'command' ports on front panel • OTHERS: reserved
J112	Serial Mode Control 1(S1)	Not Installed	
J113	Serial Mode Control 2 (S2)	Not Installed	
J115	Force to reset payload domain parts	Not Installed	• Installed: Reset payload • Not Installed: Normal Operation

Table 2-5: PP50 Jumper Information

Jumper	Function	Default	Settings
J116	Force Payload Power On	Not Installed	• Installed: Force blade power on [ignores IPMC] • Not Installed: Normal operation - IPMC controls power on/off
J117	Select XLR0 Boot Flash Bank	Not Installed	• Installed: XLR0 boot from the first bank • Not Installed: XLR0 boot from the second bank
J118	Select XLR1 Boot Flash Bank	Not Installed	• Installed: XLR1 boot from the first bank • Not Installed: XLR1 boot from the second bank
J119	Force to reset CNODE module	Not Installed	• Installed: Reset CNODE module parts • Not Installed: Normal Operation

2.2.11.2 Force Power On Jumper: J116

By default this jumper is open and the power is controlled by the CNODE. The primary 12V power turns on as soon as A_OK or B_OK is true indicating that one of the 48V feeds is in range.

When the jumper is installed, the secondary power turns on as soon as the primary 12V is in range. This is regardless of the state of any CNODE control. Also, the secondary fault latch-off feature is disabled so the board will remain powered even if one of the supplies is not in range. This feature should be used carefully.

2.2.11.3 Console Mux Bypass Jumpers: J112, J113

The following jumpers allow reconfiguration of the front panel console, redirecting it to one of the CPU ports. This allows console access before the IPMC console MUX code is available. See Section 2.2.11, "Jumpers" for further details.

Table 2-6: Console Debug Bypass

S1 (J112)	S0 (J113)	Front Panel	Function
Open	Open	UART 1	Normal Operation
Open	Inst	MUX1	Triple Output 1
Inst	Open	MUX2	Triple Output 2
Inst	Inst	Does not work	Reserved

In triple output mode, two of the payload data leads are multiplexed onto the modem control pins.

Table 2-7: Debug Mode – Triple MUX Modes

FP Connector Pin	MUX 1 Mode	MUX 2 Mode
TxD	PPC405 UART1 TxD	PPC405 UART1 TxD
RxD	PPC405 UART1 RxD	PPC405 UART1 RxD
RTS	XLR0 Console TxD	XLR0 Command TxD
CTS	XLR0 Console RxD	XLR0 Command RxD
DTR	XLR1 Console TxD	XLR1 Command TxD
DSR	XLR1 Console RxD	XLR1 Command RxD

During any of the debug modes, the other UARTs remain connected normally. In modes 1-4 (single UART bypassed), the modem control signals are driven to active states. The inputs are ignored.

2.2.11.4 Spare Serial Config Jumper: J111

Since only three serial configurations are needed on this board, J111 is reserved for future use.

2.2.11.5 Alt Boot Bank Select Jumpers: J117, J118

By default this jumper is open and _BANK_SEL and _SEL(2) for XLR0 and XLR1 are controlled from the CNODE.

When installed, BOOT_BANK_SEL or BOOT_BANK_SEL2 are forced HIGH to select the second bank. The initial state of these lines is LOW until modified by the CNODE. This allows the second bank to be tested.

2.2.11.6 Reserved Jumpers

Table 2-8: Reserved Jumpers

Jumper	Function	Default
J30	Reserved for Factory Test	Not Installed
J31	Reserved for Factory Test	Not Installed
J32	Reserved for Factory Test	Not Installed
J33	Reserved for Factory TesT	Not Installed
J34	Reserved for Factory Test	Not Installed
J35	Reserved for Factory Test	Not Installed

2.2.12 Power Design

The PP50 Blade supports ATCA standard dual -48V power inputs. The input power monitor is set to shut off if any of the following conditions are met or exceeded:

- Input current meets or exceeds 5 Amps
- Input voltage is less than -38V
- Input voltage is greater than -75V

In addition to the -48V input monitoring, a hold-up circuit is provided to give 5ms of hold-up voltage on the input to system power supplies if the input power is shut off.

2.2.13 Mean Time Between Failures

The mean time between failure (MTBF) rate for the PP50 front board is 116,347 hours and 1,081,629 hours for the RTM.

2.3 Component Integration Overview

Depending on the configuration, software for the PP50 may include a variety of firmware, utilities, development environments, libraries, demonstration apps, and diagnostics. While customized software applications and protocol stacks can run on the PP50, they are not part of the core product and are not covered in this document.

2.3.1 Firmware

The PP50 firmware falls into the following categories.

Table 2-9: PP50 Major Firmware Categories

Component	Description
IPMI/IPMC Firmware	Firmware run by the IPMC
XLR bootloader	The bootloader for the XLR packet processors, with customizations and extensions by Continuous Computing for better manageability.
XLR diagnostics	Extensions to the XLR_Diagnostics to support hardware bring up and verification.
XLR linux image	A bootable filesystem based on the one provided by RMI, but with copies of Continuous Computing demos, diagnostics, and utilities included.
XLR MIPS development environment	The gcc, gdb, libtools, and other utilities for building software applications that run on the XLR. These tools are generally available both in x86-hosted cross versions and native on the XLR linux image.
PP50 Host Tools	Any tools or utilities intended to run on another host for configuring or managing the PP50. This includes image downloaders, etc.

2.3.2 IPMI

The PP50 uses the industry standard IPMI (Intelligent Peripheral Management Interface) for communication as mandated by the IPMI standard versions 1.5 and 2.0.

For a list of optional and mandatory IPMI commands supported by the PP50, see Chapter 7, "Intelligent Platform Management Controller" for details.

Per IPMI standards, the PP50 IPMC (Intelligent Peripheral Management Controller) controls the blade and communicates through the Intelligent Peripheral Management Bus (IPMB). The IPMB consists of dual independent buses that connect to all the system boards, including the shelf manager, through the chassis midplane.

Also connected to the IPMC is the FRU inventory eeprom. That eeprom stores the PP50's serial number, part number, manufacture date, MAC address and other critical identifying information.

When a PP50 is plugged in, the shelf manager can be queried to ensure the correct blade has been inserted and may be safely powered up. Shutdown is also coordinated between the CNODE and shelf manager when a PP50 is ejected from the chassis.

2.3.3 IPMC

The IPMC is responsible for important functions, such as turning power on and off and monitoring the power levels. Specifically, it coordinates with redundant shelf managers to check if all the power converters are working correctly, voltages are within their proper thresholds, and temperatures are within safe ranges.

Figure 2-10 diagrams the IPMC topology. At the base of the IPMC is the universal bootloader (uboot). A Linux kernel runs on top of that. Above the kernel is the IPMC and base and fabric software management. For the most part, these components require no input or customization.

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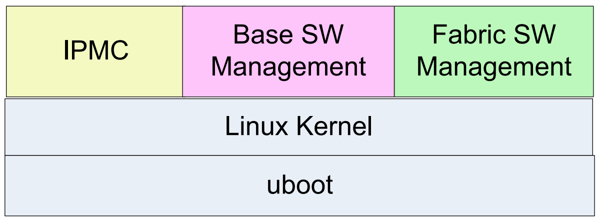


Figure 2-10: IPMC Overview

2.3.4 IPMC and XLR Software Domains

Each PP50 has two XLR processors and an IPMC, each with its own software domain. Continuous Computing provides the proprietary code for the IPMCs. Generally speaking, Continuous Computing customers will have no need to change the IPMC code.

2.3.5 XLR Watchdog Timers

There are two watchdog timers in the IPMC to monitor each XLR's booting process. Users can enable the watchdog timers by setting the associated KV values s0_bootwd and s1_bootwd.

The key value s0_bootwd and s1_bootwd save the XLR boot time (units in seconds). When the XLR0 OS cannot boot up in the KV s0_bootwd time, the IPMC will reset XLR0 and log its reset cause and reset time in the KV __s0_rstcause and __s0_rsttime.

XLR1 also follows the same procedure except that it uses s1_bootwd, __s1_rstcause, and __s1_rsttime. The KV 'sobootwd' and 's1bootwd' are created by default.

The watchdog timer is particularly useful when using the multiboot, see Section 6.2.1, "Continuous Computing Multiboot" for details.

2.3.6 XLR Software

The PP50 maximizes the XLR’s two 10GbE network interfaces and processing power (8 cores, 4 threads each, 32 virtual processors).

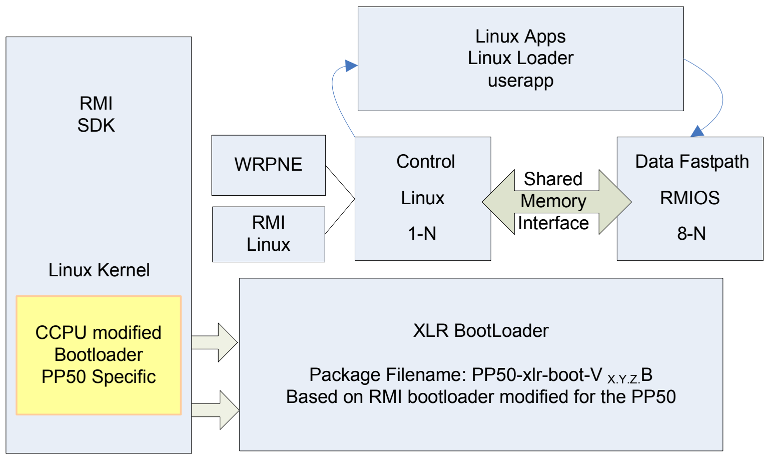


Figure 2-11: XLR Software Overview

Referring to Figure 2-11, note that the XLR Bootloader's package uses the naming convention pp50-xlr-boot-vx.y.z.bin. The package is based on the RMI bootloader, but has been modified to run on the PP50. Standard unmodified RMI bootloaders will not run on PP50s. Requests for enhancements to the bootloader should be made to Continuous Computing. They will be included in qualified releases.

The RMI SDK in this context should only be used as reference code for building PP50 applications. Unmodified RMI SDK code cannot be directly used in PP50 applications.

A common option is to run, on top of the XLR bootloader, Linux on 1-N cores of the XLRs and the RMIOS on the other 8-N cores. Operating systems typically are run on a per core basis. Running them on a per thread basis is possible but not recommended.

Typically, Linux threads are used to run control software such as call management, bandwidth allocation and load balancing. RMIOS threads are used to take packets in and send them out (fastpath, 10 Gb interface). A shared memory interface allows the Linux threads to communicate with the RMIOS threads. The RMIOS comes from the RMI SDK with little modification.

The Linux loader application runs on top of the Linux OS. It primarily runs the user-app command. The userapp command loads and unloads RMIOS programs from within Linux. Linux running on core one can tell the userapp command to load RMIOS on the other seven cores and to start.

Note: The Linux OS, bootloader RMIOS, and Linux loader application being run on a PP50 **must** all come from the same version of the SDK.

2.3.7 XLR and IPMC Messaging

The IPMC communicates with each XLR (sometimes referred to as payload) through two serial ports. One port is the console channel, the other is the payload channel.

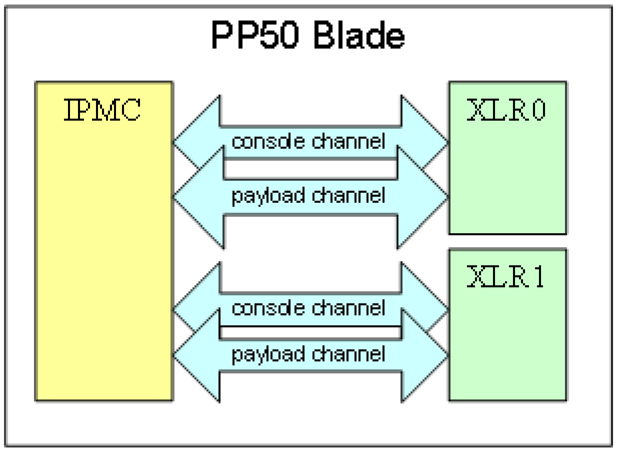


Figure 2-12: XLR and IPMC Messaging

When the XLRs boot, they send information such as the boot loader prompts and kernel bootloader strings to the IPMC through the console channel.

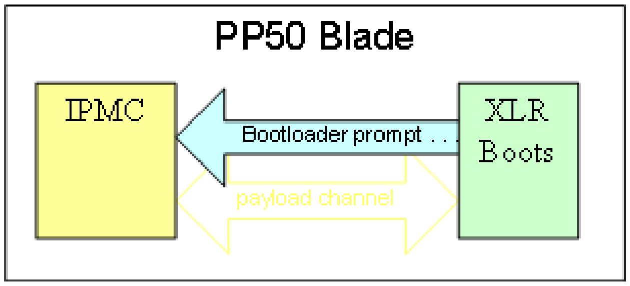


Figure 2-13: XLR and IPMC Boot Messaging

Users access the XLRs from this console channel. They telnet through the network to the IPMC and request connection to XLR0 or XLR1.

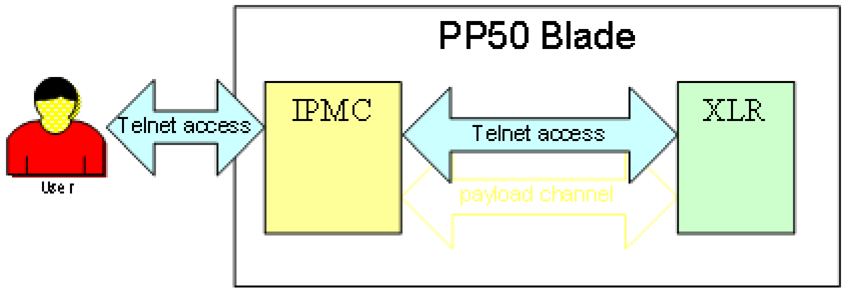


Figure 2-14: XLR and IPMC Telnet Messaging

The payload channel is an IPMI messaging channel. The payload sends IPMI messages in a serialized format to the IPMC. The IPMC then responds to those messages. For example, when the XLR wants to strobe its watchdog, it sends a strobe watchdog message over the payload channel that resets the watchdog timer.

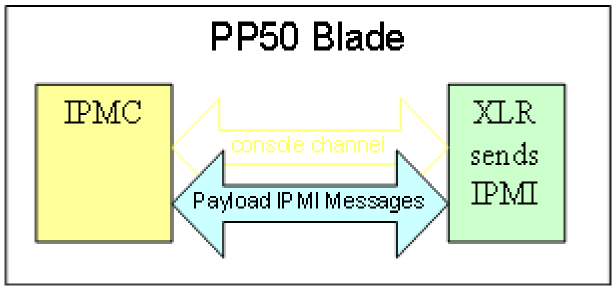


Figure 2-15: XLR and IPMC IPMI Messaging

The PP50's IPMC also handles several other functions. In this document, the IPMC plus these other functions are referred to collectively as the CNODE.

An important function of the CNODE is its internal base switching. Because the ATCA standard only allows two base ports per blade (one to each of the switches in a chassis), normally only one XLR could have access to the switches at a time. To overcome this limitation and be consistent with High Availability (HA) principles, an internal base switch was created on the PP50. This base switch is partitioned to look like it has two base switches. Each XLR gets a virtual base; consequently, each XLR has access to both base ports and switches using different GMACs.

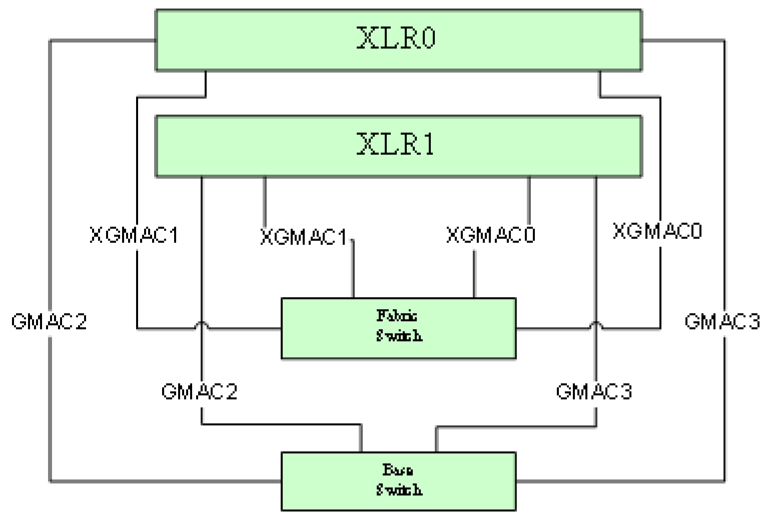


Figure 2-16: Virtual Switches

The CNODE also handles base switch configuration and management. All base switch connectivity for the PP50 is handled through this switch.

A fabric switch on the PP50 helps avoid a similar constraint on the fabric plane. The midplane has two 10Gb interfaces. Connecting one interface to each payload would not allow redundancy for HA. Like the base switch mentioned above, the fabric switch is partitioned into two virtual switches. Each of those midplane ports goes to one half of the fabric switch and each of the XLRs has connections to the fabric switch. Either XLR can get to either half of the fabric switch, and thus can get to either one of the fabric ports on the midplane.

Both the fabric and base ports connect to hub one and two via the midplane to access the chassis switches.

2.3.8 Power Domains

The PP50 has two power domains, management and payload. The management domain powers components of the PP50 that manage the board. The payload domain powers components associated with the payload. When a board is plugged in, the management domain is powered up first to ready the blade for operation. Once the PP50 is ready for full operation, the payload domain is powered up.

The CNODE is on the management power domain. As soon as a PP50 is plugged in, the management domain is powered up and functioning. The base switch comes up, then CNODE comes up and starts the IPMC, which queries the shelf manager whether to start the PP50’s payload power domain. If it gets an OK, the CNODE starts up the payload domain.

It is important to note that the fabric switch manager is part of the payload power domain. Therefore, the fabric switch and XLRs only start after the CNODE signals the fabric switch manager to power on.

The CNODE signals the fabric switch manager to power on through a daemon, which runs a script that configures the fabric switch when the payload domain is activated. The daemon also monitors the fabric switch for proper functioning. For example, if a link is disconnected and reconnected, the switch responds appropriately and the link continues to work uninterrupted.

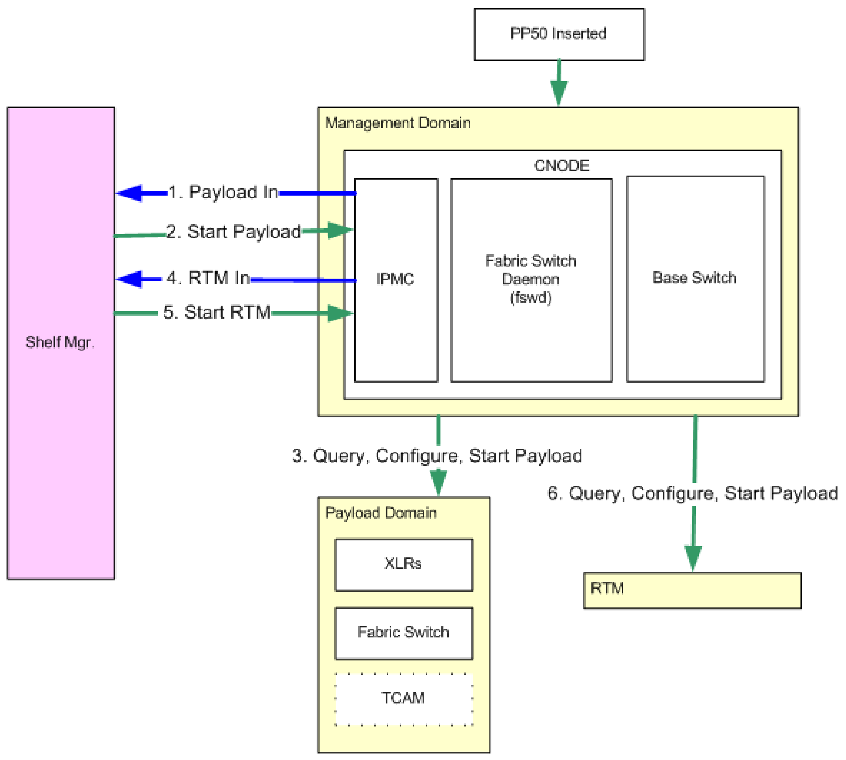


Figure 2-17: Power Domains, Startup

The fabric switch may also be custom configured to do things such as change traffic flow, handle VLANs, and direct certain packets to specific boards or payloads. A detailed description of fabric switch configuration is provided later in this document.

2.4 Specifications

2.4.1 CPU / Memory

- 1 or 2 RMI XLR732 processors
- 1GHz multi-core MIPS64, 8 multi-threaded cores (32 virtual cores)
- 2MB of 8-way set associative L2 cache
- 2GB, 4GB, or 8GB DDR2 memory per processor

2.4.2 Input/Output

- Dual redundant 1GbE base interface
- 10GbE & 1GbE fabric interfaces (PICMG 3.1.9 - 10GbE and PICMG 3.1.3 - 1GbE)
- 2 x 10GbE on front panel
- RJ45 1GbE front panel management port

2.4.3 Expansion Options

- 36Mbit or 72Mbit TCAM mezzanine using Netlogic NL71024
- Optional 1Gb or 2Gb CompactFlash per processor
- OEM Rear Transition Module(s)
    - 2 x 10GbE (SFP+)
    - 10 x 1GbE (SFP)

2.4.4 Software

- Wind River Linux PNE
- RMI Operating System (Native C-based OS for fast path)
- Network and routing protocols including fast path and slow path functions
    - Includes IPv4/6 forwarding, IPSEC, Tunneling, GRE, etc.

2.4.5 Mechanical & Environmental Compliance

- Standard 8U single-slot (6 HP) front board and RTM
- Operating environment:
    - Temperature: 0C to +55C
    - Humidity: 5%-80% (non-condensing)
    - Vibration: 20Hz-2KHz random multi-axis, 0.5G RMS

- Storage/transportation environment:
  - Temperature: -40C to +85C
  - Humidity: 5%-95% (non-condensing)
  - Vibration: 20Hz-2KHz random multi-axis, 6G RMS

Assembly components meet UL 94-V0 flammability rating.

2.4.6 Fuses

Table 2-10: Fuse Specification

Location	Continuous Computing PN	Fuse Characteristics	FUSE Nominal Melting I2t A2 Sec	Manufacturer PN
F1, F2	3-01304	Surface Mount Fuse, 12A, 65V	47.59	Littelfuse Incorporated (448012)
F3, F4	3-01302	Surface Mount Fuse, 15A, 65V	96.10	Littelfuse Incorporated (448015)
F5, F6	3-01303	Surface Mount Fuse, 1A, 125V	0.441	Littelfuse Incorporated (448001)

2.4.7 Certifications

- UL 60950-1 Safety of Information Technology Equipment , UL File# E204665.

2.4.7.1 Planned Certifications

- IEC/EN 60950-1 Safety of Information Technology Equipment.
- FCC Part 15, Subpart B, Class A.
- CE Mark - Meets EMC directive 89/336/EEC.
- Designed for Telcordia NEBS GR-63-CORE and GR-1089-CORE Level 3.
- RoHS 6 / 6 Compliant.

2.4.8 Power Consumption

When the PP50 is installed with no test software running, the power consumption is 126 watts. Actual power consumption may vary depending on specific application. Contact your sales rep for detailed power consumption reports.

3

Board Installation

This chapter describes the precautions to take when planning an installation, the conditions which must be met and how to physically install a PP50 into your chassis in the following sections.

3.1 Precautions

3.1.1 Environmental Requirements

Requirements for the indoor working environment of the equipment:

- Temperature: 0^{o}C - 55^{o}C
- Relative humidity: 10% - 90% (non-condensing)
- Air pressure: 70 kPa - 105 kPa (70 kPa is equal to the air pressure at the altitude of 3000 m)

3.1.2 Heat Dissipation and Dust Prevention

- Always place the board in a clean environment with good ventilation.
- The installation site should be far away from radiator or heat sources, and free of conductive dust, corrosive gases and explosives.
- Do not operate your system in dusty environments. This will clog the filters and lower the cooling efficiency.

3.1.3 Electrostatic Prevention

Caution: Always maintain an ESD-safe environment during the installation, many components can be destroyed by ESD.

Static electricity can harm delicate components. To prevent static damage, discharge static electricity from your body before you touch any components. You can do so by wearing an antistatic wrist strap.

Remember to wear an antistatic wrist strap during equipment installation and debugging.

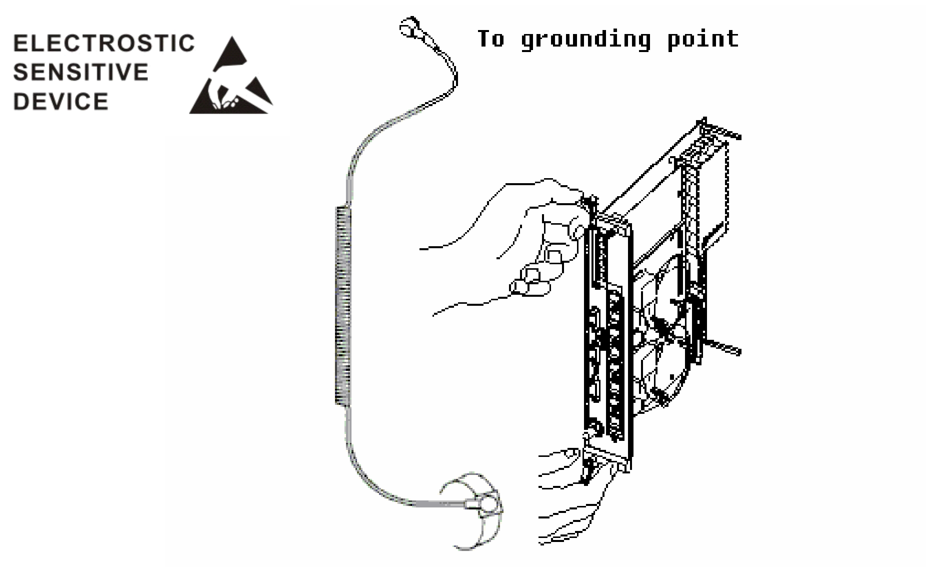


Figure 3-1: ESD Wrist Strap

You can also take the following steps to prevent damage from electrostatic discharge:

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component. Just before unwrapping the antistatic packaging, be sure to use a grounding strap to discharge static electricity from your body.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

3.1.4 Other Precautions

- Do not block the heat-dissipating vents of the equipment.
- Position the equipment in a stable location to avoid strong vibration.
- Prevent the equipment from hitting or rubbing other equipment to avoid surface damage.
- Keep your system away from radiators and heat sources.
- Do not block air intake or air exhaust vents.
- Be sure nothing rests on cables and that the cables are not located where they may be stepped on or tripped over.

3.2 Unpacking the PP50

The following photo shows generic PP50 packaging. Your packaging may vary depending on such variables as specific options chosen and country of delievery.

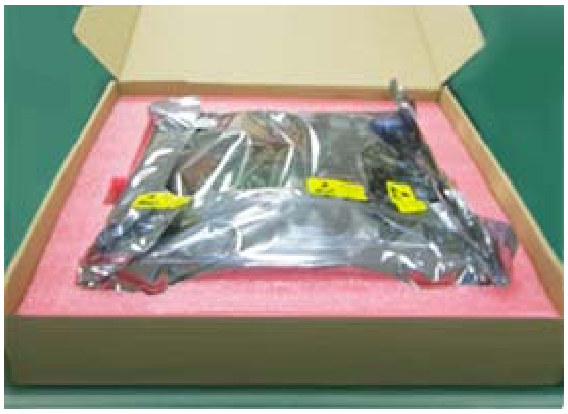


Figure 3-2: PP50 Unpacking

When unpacking inspect for the following:

- Check the number of items against the dispatch list.
- If anything is damaged or missing, immediately follow the procedures in Appendix 13, "Product Repair and Returns" or contact our After-Sales Service Center.

Note: Only personnel experienced with installing telecommunication equipment should unpack and install these boards.

3.2.1 Compact Flash

Do not remove the compact flash cards. They protect the connector pins from damage. If the board is handled without the flash modules, the pins can bend, short, and the interface can be permanently damaged. Flash cards may be replaced with a different card but not leave the socket empty.

3.2.2 Board Identification

3.2.2.1 Serial Number

PP50s may be identified by the board serial number as shown below.

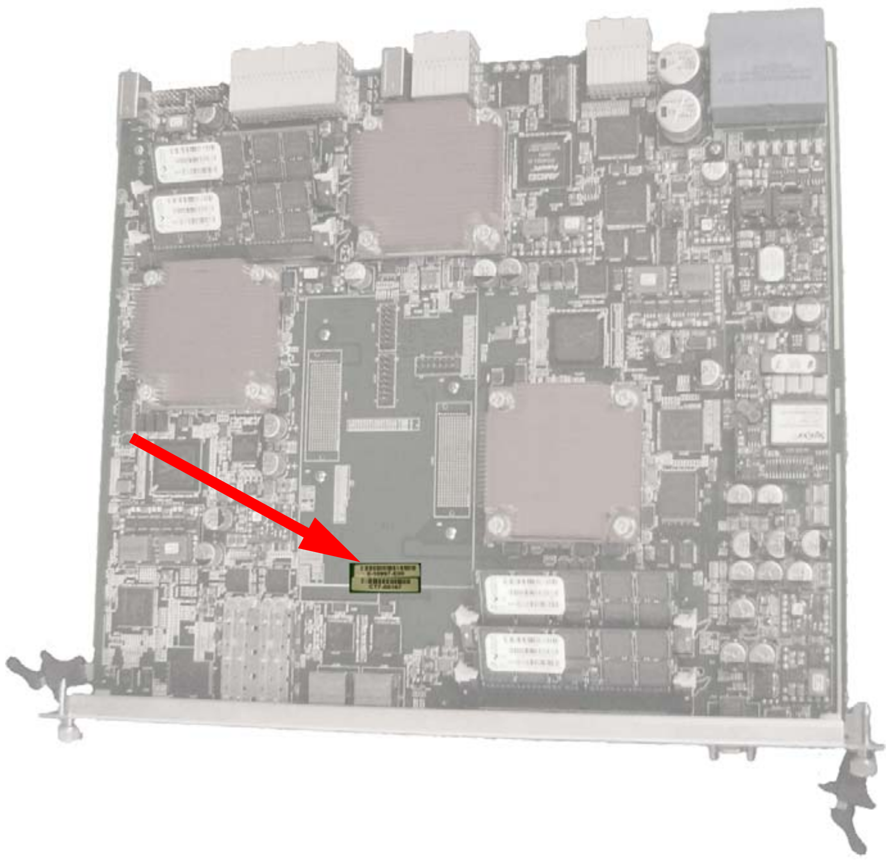


Figure 3-3: Serial Number Location

3.2.2.2 MAC Address

Each PP50 board is has 16 MAC addresses. All have a 00:02:bb:50 prefix. The lowest-numbered address is the BASE address and always ends in '0' (hex). Each network port on the PP50 board is a fixed offset from the BASE address as described below.

Table 3-1: MAC Address Ports

Chip	Address	eth	Port	Example
XLR0	BASE+0	eth0	gmac0	00:02:BB:50:2A:80
	BASE+1	eth1	gmac1	00:02:BB:50:2A:81
	BASE+2	eth2	gmac2	00:02:BB:50:2A:82
	BASE+3	eth3	gmac3	00:02:BB:50:2A:83
	BASE+4	eth4	10G xgmac0	00:02:BB:50:2A:84
	BASE+5	eth5	10G xgmac1	00:02:BB:50:2A:85
IPMC	BASE+6	eth0	Base Network 1	00:02:BB:50:2A:86
		eth0.4094	Base Network 1 (Alias)	00:02:BB:50:2A:86
	BASE+7	Reserved	Base Network 2	
XLR1	BASE+8	eth0	gmac0	00:02:BB:50:2A:88
	BASE+9	eth1	gmac1	00:02:BB:50:2A:89
	BASE+A	eth2	gmac2	00:02:BB:50:2A:8A
	BASE+B	eth3	gmac3	00:02:BB:50:2A:8B
	BASE+C	eth4	10G xgmac0	00:02:BB:50:2A:8C
	BASE+D	eth5	10G xgmac1	00:02:BB:50:2A:8D

3.2.2.3 Part Number

The PP50s part number may be found in the location shown below.

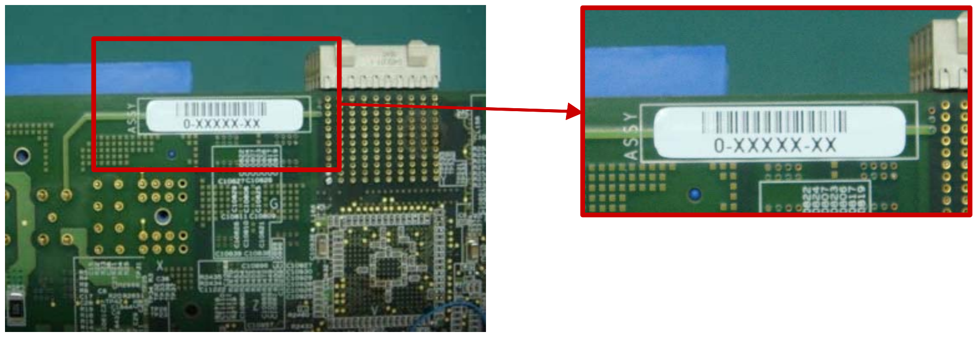


Figure 3-4: Part Number Location

3.2.2.4 MAC Address Location

The PP50s MAC address may be found in the location shown below.

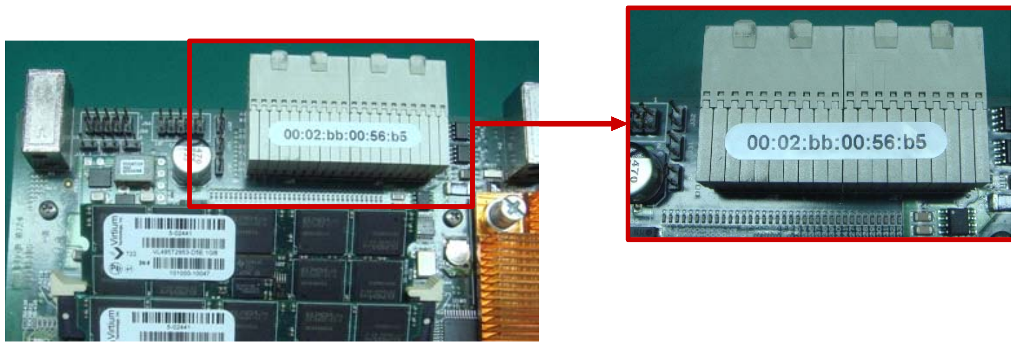


Figure 3-5: MAC Address Location

3.2.2.5 IPMI Manufacturing Info

The IPMI GetDeviceInfo command specifies each device return a manufacturer and product ID field. The manufacturer field is three bytes and contains Continuous Computing's IANA OUI (7994) in a binary representation (0x001F3A, represented little-endian in the actual IPMI response as 0x3A, 0x1F, 0x00).

- IPMI Manufacturer ID: 0x001F3A (7994)
- IPMI Product ID: 0xBB50

3.3 Installing PP50s into the Chassis

Caution: Air blockers **must** be installed into all vacant slots to ensure proper air flow and cooling for the blades, Operation without air blockers in all empty slots voids the warranty.

3.3.1 Where to Install the PP50

The PP50 board can be installed in the node slot of any ATCA compatible chassis. In Continuous Computing's 5U and 12U chassis, the PP50 should be installed in the slots shown in the following figures. For chassis details, please refer to their respective user manuals.

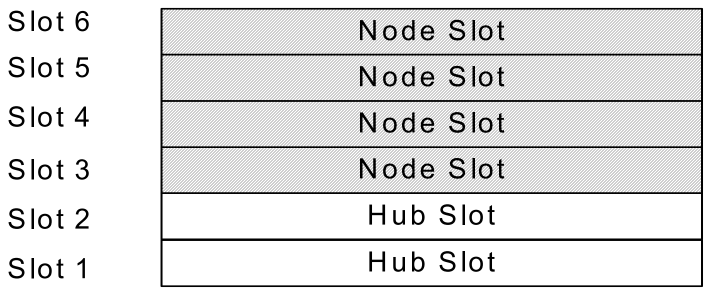


Figure 3-6: 5U Chassis Slots

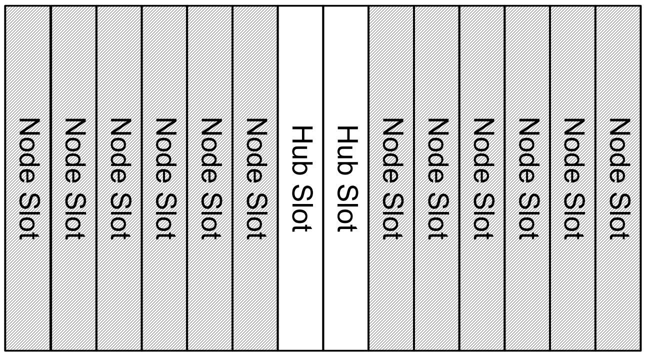
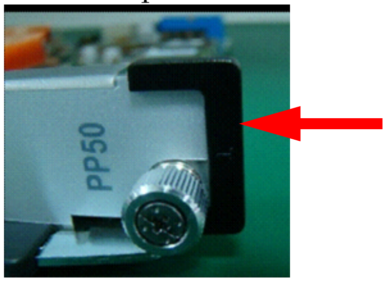


Figure 3-7: 12U Chassis Slots

3.3.2 Board Insertion

1. If present, remove black end caps.



2. Disengage the latch handles as follows.
   a. Place the board on an ESD-safe work surface.

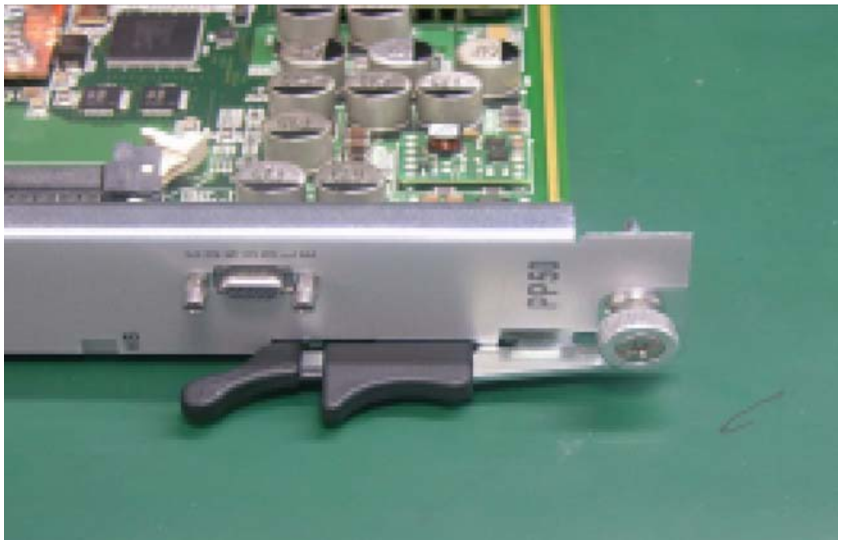


Figure 3-8: Latch Handle

   b. Grip both the handles with your thumbs and index fingers.

c. To disengage the locking mechanisms, firmly squeeze the lever portions of both handles simultaneously, pressing them toward their respective locator pins. At the same time, pivot the handles out away from the board as shown below.

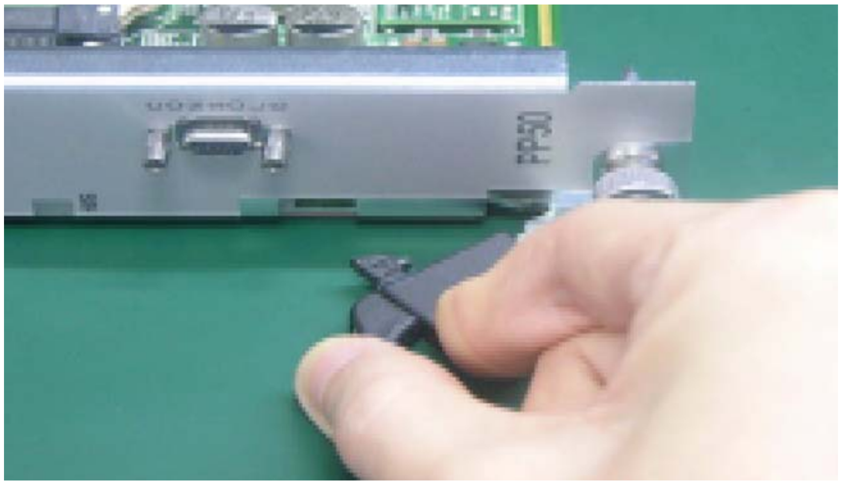


Figure 3-9: Opening the Latch Handle, Lever Release

d. Release the handles once they have cleared the slot/catch, and continue to pivot the handles outward until they are at a 90 degree angle from their original positions as shown in Figure 3-10.

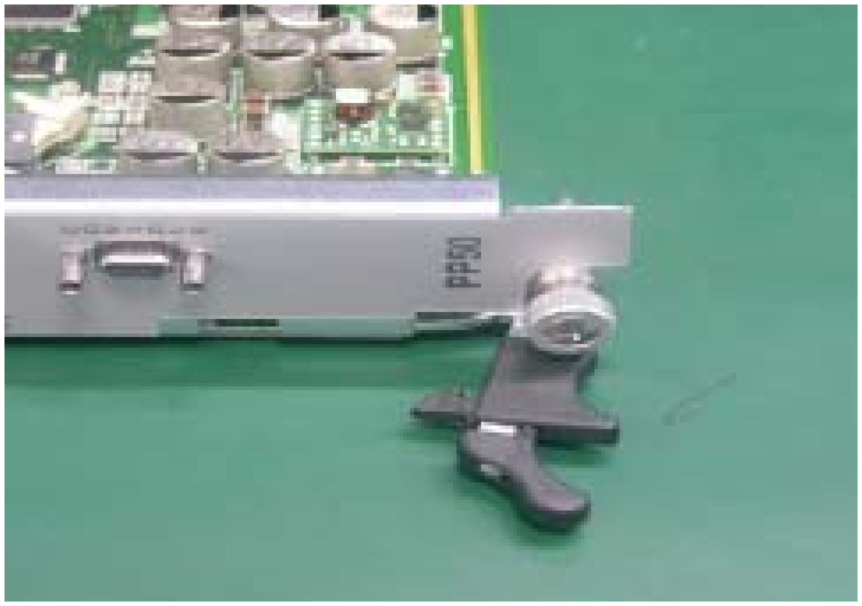


Figure 3-10: Opened Latch Handle

3. Carefully begin inserting the board into the desired slot within the chassis.

Caution: Be careful when installing the boards into the chassis. The board handles can be shaved off when they are inserted through the cutout. Components can be destroyed because of improper insertion technique. Do not use force.

Caution: Take care not to bend the connector pins as you remove and install the board.

- Grip the board anywhere on its faceplate during this process, *except* the handles.
- Line up the locator pins at both ends of the board to the locator pinhole/ guide on the chassis.

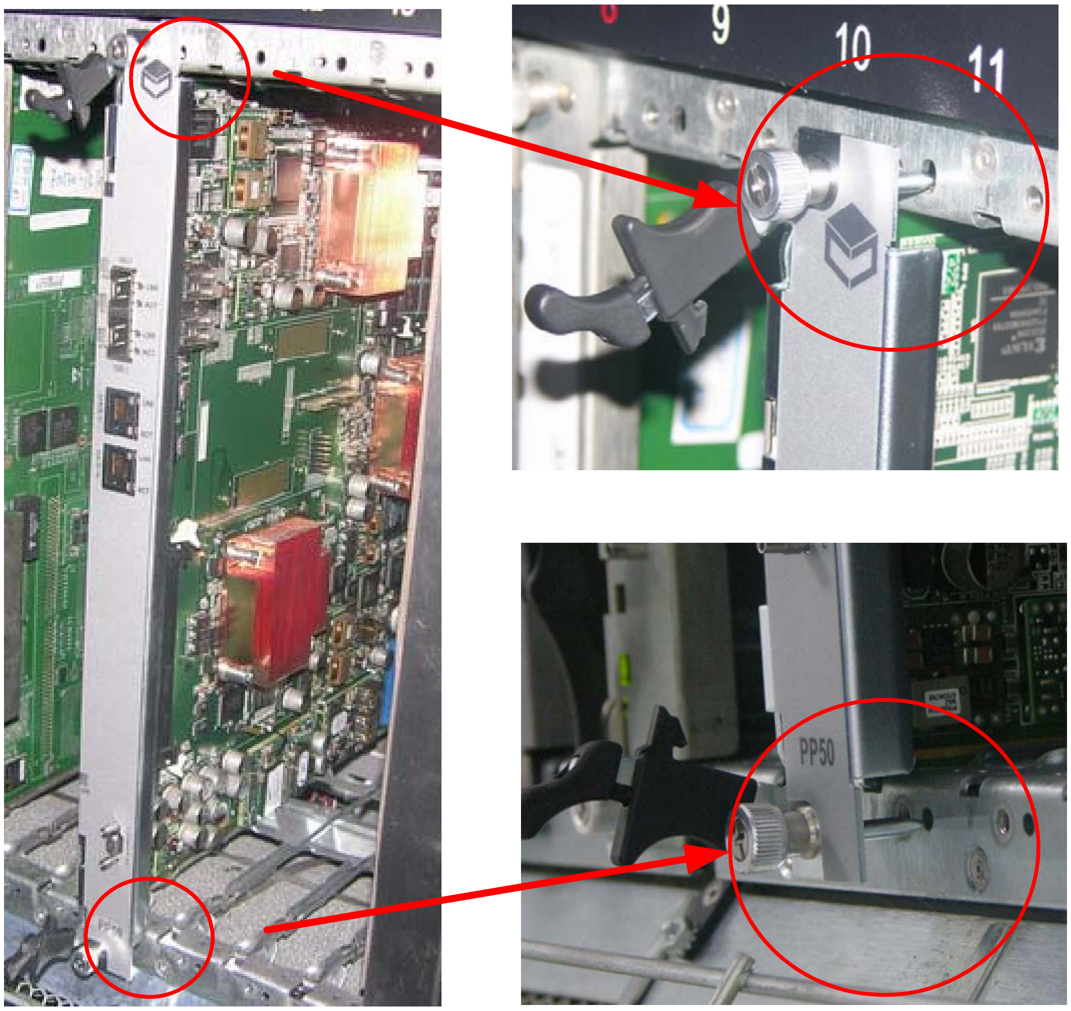


Figure 3-11: Installation - Locator Pins

4. Once the locator pins are aligned with the pin holes/guides, slowly press the board further in.
   - Position hands/thumbs as shown to ensure the locator pins remain in alignment with their holes/guides.
   - Do not hold the handles during this insertion process; allow them to move freely.
   - Stop this insertion process once the handles are roughly 45 degrees from the front of the faceplate.

Note: Although only the top handle is shown in the illustrations, both handles must be at a 45 degree angle.

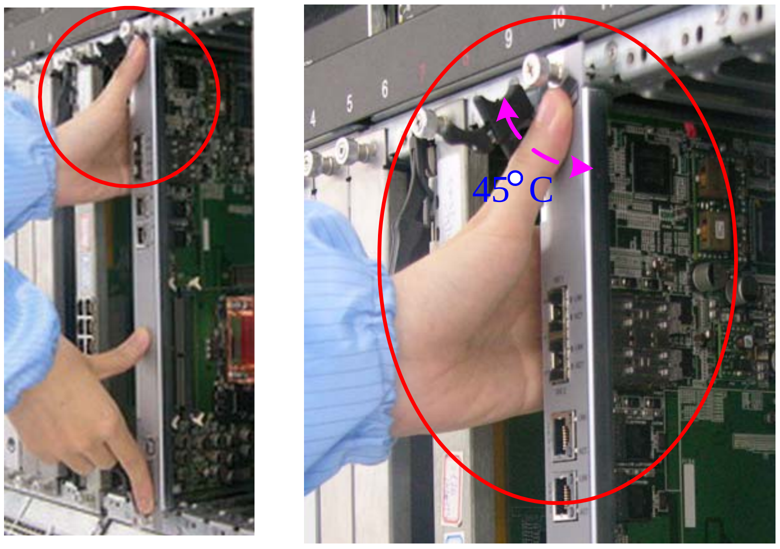


Figure 3-12: Installation - Board Insertion

5. Engage the handles.
   - Squeeze both the top and bottom handles simultaneously, and hold. Then, loosely and carefully insert the tip of each handle's catch into the slot. Be careful not to hit the slot edges to avoid damage to the handle.
   - Once you are certain the alignment is correct, while still squeezing the handles, engage the latches fully. Ensure that the handles are fully engaged by pressing them in firmly.

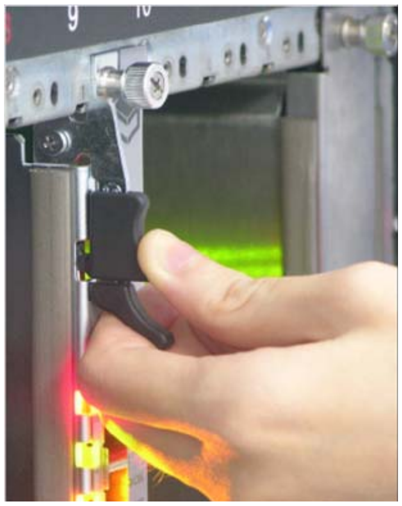


Figure 3-13: PP50 Installation - Board Insertion, Latch Closure

   - The blue HS (Hot Swap) LED on the face-plate (near lower handle) should illuminate, and then blink. After a few moments, it should turn off. If this doesn't happen, back the handle out slightly then re-engage.
6. Tighten the front panel thumb bolts with a screw driver to secure it to the chassis. Failure to do so may result in improper board behavior.

3.3.3 Air Blocker Modules in Vacant Slots

Air blockers must be installed into all vacant slots to ensure proper air flow and cooling for the blade, Operation without air blockers in all empty slots voids the warranty.

4

Board Access, Bootup, and Shutdown

This chapter describes how to access, boot up, shutdown, and reset the PP50 in the following sections.

- Section 4.1, "Serial Console Access"
- Section 4.2, "IPMC Telnet Access"
- Section 4.3, "Console Access for Development"
- Section 4.4, "Board Shutdown"
- Section 4.5, "Board Reset"

4.1 Serial Console Access

4.1.1 Connect to the Serial Console

1. Construct or purchase (PN 5-02138, 72 inches) a serial the cable like the one shown below.

   The cable has a 9-pin Micro-D receptacle on one side and a standard DB-9 plug on the other. Note a null modem cable (DB-9 receptacle on both ends) might also be required to interface to your workstation, terminal server, laptop or USB serial port.

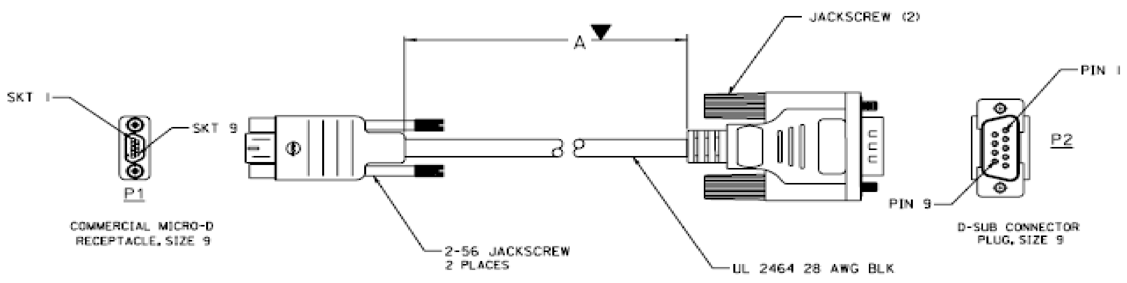


Figure 4-1: Serial Console Cable

2. Connect the serial cable from a computer to the PP50's front panel serial port.

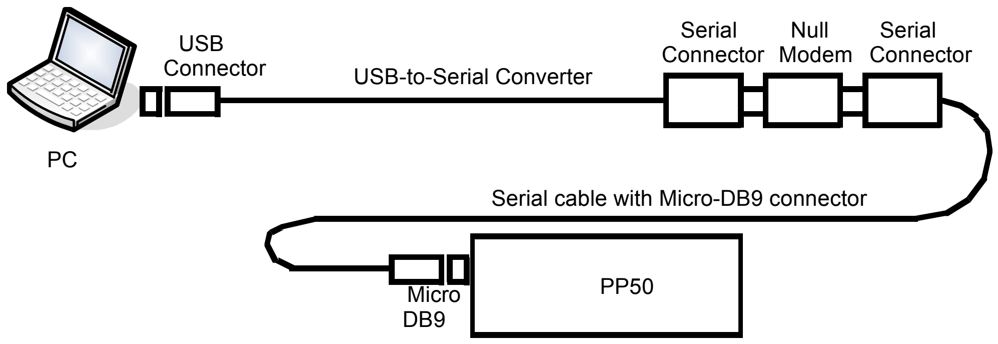


Figure 4-2: Connecting Computer to the Serial Console

3. Run a terminal emulator program on the laptop.

4. Use the following connection settings:
   - 115200 baud rate
   - No parity
   - 8 bits
   - 1 stop bit
   - no flow control

Note: During bootup, if the board receives any keystroke signals from the serial port, boot up will be halted. Incorrect connection settings can cause false signals so it is critical the parameters above are set correctly.

5. Boot the PP50. By default the console is the IPMC running Linux.
6. See the next section to toggle between the IPMC and XLRs.

4.1.2 How to Switch Between Serial Consoles (IPMC, XLRs)

Use the following sequences to switch the front panel console port between CPUs:

On the front panel console, use the following sequences to connect to the XLR's serial console via the IPMC:

- In the IPMC, use command "cu" to switch the console to XLR0

```
cu -l /dev/ttyS2a
cu -l /dev/ttyS2b
cu -l /dev/ttyS2c

cu -s 38400 -l /dev/ttyS3 (secondary XLR0 console when running in dual mode Linux/
RMIOS)
```

- In IPMC Linux, use command "cu" to switch the console to XLR1

```
cu -l /dev/ttyS4a
cu -l /dev/ttyS4b
cu -l /dev/ttyS4c

cu -s 38400 -l /dev/ttyS5 (secondary XLR1 console when running in dual mode Linux/
RMIOS)
```

- To disconnect from the XLR serial console, press “~”, and “.”.

Note: If you connect to the IPMC's console port by telnet or Windows Hyperterm, the telnet escape character is Ctrl-].

If you use a shell or program that uses “~” as its escape character (such as SSH or another CU session), then you must type two “~”s for each “~” that actually needs to get to the IPMC.

Note: If the hydra mode enable serial mode jumpers are installed, the XLR console cannot be toggled. To avoid this, please make sure all jumpers on the board are removed. See Section 2.2.11, "Jumpers" for details.

4.2 IPMC Telnet Access

The IPMC has two network interfaces. One is "eth0" for base channel A and the other is "eth0.4094" for base channel B. By default eth0's IP address and gateway IP address are obtained from the DHCP server. Use the ifconfig (interface configuration) to obtain details.

```
root@cnode-pp50:~ ifconfig

eth0      Link encap:Ethernet  HWaddr 10:02:BB:50:43:44
          inet addr:10.4.1.43  Bcast:10.4.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1400  Metric:1
          RX packets:2024 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:154769 (151.1 KiB)  TX bytes:1200 (1.1 KiB)

eth0.4094 Link encap:Ethernet  HWaddr 10:02:BB:50:43:44

          UP BROADCAST RUNNING MULTICAST  MTU:1400  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

Please see Chapter 7, "Intelligent Platform Management Controller" configure eth0 and eth0.4094 via the key-value database.

4.2.1 Setting eth0 IP Address Manually

To manually set eth0's IP Address, please see the example below.

```
root@cnode-pp50:~ ifconfig eth0 10.4.1.43 netmask 255.255.0.0
root@cnode-pp50:~ route add default gw 10.4.0.254
```

4.2.2 Setting eth0.4094 IP Address Manually

By default, eth0.4094 has no IP address. To configure its IP Address:

```
root@cnode-pp50:~ ifconfig eth0.4094 192.168.0.2 netmask 255.255.255.0
root@cnode-pp50:~ route add default gw 192.168.0.254
```

Note: If one interface gets an IP address via DHCP, the other address is assigned a static IP address/netmask/gateway, then there are two default routes. When this happens the DHCP route has higher priority.

4.2.3 Setting the DNS Manually

Use vi or similar editor to manually edit the DNS configuration file shown below.

```
root@cnode-pp50:~ vi /etc/resolv.conf
```

Note: If eth0 or eth0.4094 uses DHCP protocol, it does not update the DNS configuration. If "dnsdomain" is set to “dhcp” or null, it does not update the DNS configuration. If “dnsdomain” is set to “disable”, it will remove the DNS configure file (/etc/resolv.conf). If “dnsdomain” is valid, but “dns_ns1” and “dns_ns2” are invalid, it does not update the DNS configuration.

4.3 Console Access for Development

4.3.1 Development Adapter (Hydra) Cable

To facilitate software development and debugging Continuous Computing created a special cable which allows simultaneous console access to both XLR CPUs and the IPMC. It is sometimes referred to as a "hydra" adapter cable and may be special ordered from Continuous Computing(part number 0-11010). This section describes how to use it.

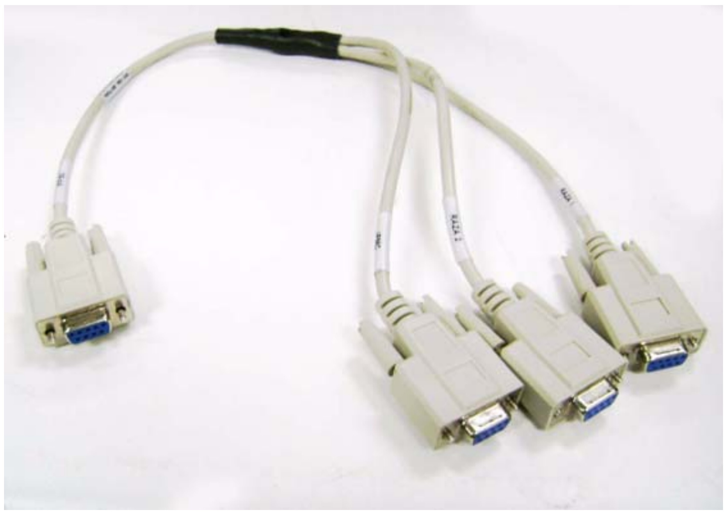


Figure 4-3: Hydra Cable for Multiple Simultaneous Connection

Note: The PP50s debug-mode jumpers must be installed (J111 and J113) to use this cable. See Section 2.2.11, "Jumpers" for details.

This adapter cable performs the null modem function, so a null modem cable is not used with this cable. However, users may need a straight-through serial extension cable, with a standard DB-9 plug on one side and a DB-9 receptacle on the other, depending on their development system configuration.

To Connect the hydra cable:

1. Power down and remove the board if necessary and install jumpers J111 and J112. See Section 2.2.11, "Jumpers" for details.

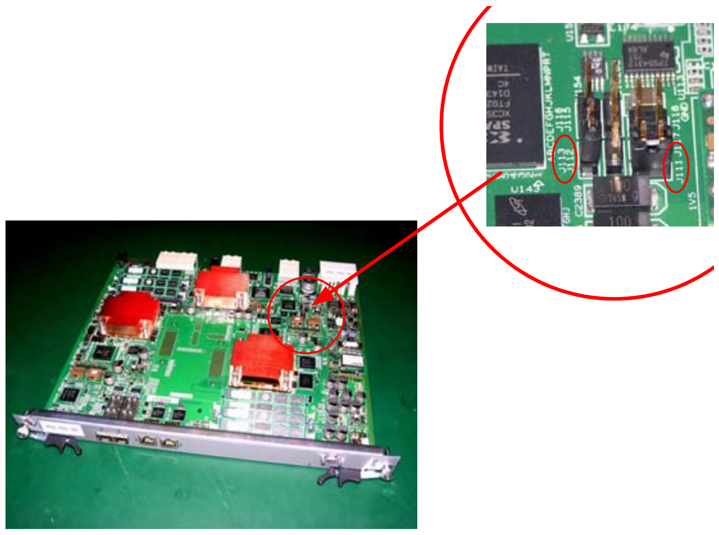


Figure 4-4: Hydra Cable Jumpers (J111 and J113)

2. Connect micro db9 to the PP50 console port.
3. Connect hydra cable to end of db9.
4. Connect one end of the hydra cable marked IPMC to either laptop or linux machine.
5. Open serial console using hyperterminal. Set the baud rate settings as follows:
   - 115200 baud rate
   - No parity
   - 8 bits
   - 1 stop bit

4.4 Board Shutdown

PP50s can be shutdown issuing an IPMI command to deactivate the board or by opening the front panel handle latch.

During the deactivation of the board, each of the managed FRUs on the board gets deactivated. You can also deactivate each individual FRU by issuing deactivation command from the Shelf Manager. For example, on Pigeon Point ShMC this command is “clia deactivate <ipmb address of board> <fru_id>”. If you deactivate the master FRU then IPMC also deactivates all of its slave FRUs. On PP50, the Front board FRU (id 0) is the master FRU.

During a FRU’s deactivation, all the payloads belonging to that FRU are shutdown gracefully. Please refer to the description of KV key “shutdown_wait” in the Section 7.4.1, "KV Keys" for the configuration related to graceful payload shutdown during FRU deactivation.

4.4.1 Using the IPMI Command to Shutdown

You can issue deactivation commands from your chassis’ shelf manager. For example, on the Pigeon Point ShMC this command is "clia deactivate board <N>”, where N is the logical slot number of the board. On deactivating board from shelf manager, the HS (hotswap) blue led will start blinking and then become solid blue after a while. When it is solid blue you may remove the board.

4.4.2 Using the Handle Latch to Shutdown

Leaving the board in its slot, open the board’s front handle latch out of locked position. The blue HS (hot swap) LED will start blinking indicating the board is shutting down. When the blue LED turns solid blue then board is shutdown and can then be removed from the chassis slot.

4.5 Board Reset

The board reset command resets all devices on the board. To reset the complete board you can issue the IPMI Cold Reset command or reboot the CNode.

4.5.1 IPMI Cold Reset Command

In the handling of IPMI Cold Reset command (NetFn: App (0x06), Command Code: 0x02), IPMC resets complete board. On Pigeon Point ShMC, you can issue "clia sendcmd <ipmb slave addr of board> 0x06 0x02" to send IPMI Cold Reset command to the board.

Note: During the board reset via IPMI Cold Reset or rebooting CNode, payloads are not shutdown gracefully. So before performing IPMI Cold reset or rebooting CNode, user must deactivate board so that graceful shutdown of payload takes place.

4.5.2 IPMC (CNode) Reboot

Login into the CNode and run the "reboot" command, the board will boot from either bank 0 or bank 1.

Usually, the board boots from bank 0 or 1. If is a disturbance on the serial console cable during the power event and reboot, the board will boot from golden bank as a precautionary measure. The golden bank is a special bank used only for disaster recovery. It cannot boot into the kernel.

Note: If a "d" is entered in the serial console during bootup it will boot from the golden bank image. Because it cannot the kernel a "magic number" error message number will be output.

5

Using the XLR SDK

To support PP50 software development you will need a build environment, which is generally a machine running RedHat Linux with the cross-compile tool chain installed. You will also need a machine acting as the network boot server, which can be the same machine or an additional one.This process is described in the following sections.

- Section 5.1, "Installing RMI Source Code & Development Tools"
- Section 5.2, "Installing Continuous Computing Software"
- Section 5.3, "Build the Linux Kernel"
- Section 5.4, "Cross Compiling Linux Applications using the RMI SDK Crosscompiler"

5.1 Installing RMI Source Code & Development Tools

To install the RMI source code and development tools, obtain the RPMs by downloading them from Continuous Computing's support site. Contact your field support engineer for the specific area and passwords. SDK version 1.6 is supported currently.

All examples in this manual assume you install the RPMS in their default location (/opt/rmi/x.x for the vx.x SDK). In addition, some Continuous Computing makefiles rely on a symbolic link from /devel/rmi to /opt/rmi.

5.2 Installing Continuous Computing Software

The Continuous Computing PP50 support package can be downloaded from Continuous Computing's support page.

http://www.ccpu.com

The package contains the following components:

Note: Continuous Computing's bootloader and patches must be used for proper operation.

- A binary XLR bootloader with enhanced and necessary functionality for the PP50's flexible network connectivity.
- A pre-built Linux kernel based on RMI's kernel, with Continuous Computing patches applied.
- A patch file that **must** be applied to RMI's SDK kernel source and build.
- A patch file that **must** be applied to RMI's SDK RMI OS
- An application for doing basic management of the PP50's onboard 10G switch.
- Binary and source code for a demonstration program that lets the two XLR processors on the PP50 send 10GB traffic to each other.

Please refer to RMI's XLR Programmer's Reference for information on application development and compiling XLR applications.

http://www.netlogicmicro.com

Go to the RMI Developer Support page and create an account to download the document.

5.3 Build the Linux Kernel

5.3.1 Apply Kernel Patches to the RMI SDK Kernel Source

1. Download the patch from Continuous' support page at www.ccpu.com.
2. Copy src to your working directory

```
    cp -a /devel/rmi/1.x/linux/src /src-working
```

3. Apply the current patch file

```
    cd .../src-working
    patch -p1 < pp50-linux-patch-vx.y.zr00.txt
```

4. Make whatever other changes you want to your working kernel tree or kernel configuration.
5. Test them thoroughly.

5.3.1.1 Example of Using the Patch

The example below is for reference only.

```
cp -a /opt/rmi/1.x/linux/src src-1.c
cd src-1.x
patch -p1 < /raza/xlr/linux/patch-1.x/pp50-linux-patch.txt
patching file .config
patching file arch/mips/rmi/ptr/setup.c
patching file drivers/net/phoenix_mac.c
patching file drivers/net/phoenix_user_mac.c patching file include/asm-mips/rmi/
sim.h export PATH=/opt/rmi/1.x/mipscross/crosstool/gcc-3.4.3-glibc-2.3.6/
mipsisa32-xlr-linux/bin:$PATH
make menuconfig

### Make sure the options look as expected, then exit and say "yes" to using the
new configuration.

make vmlinux mipsisa32-xlr-linux-strip -o vmlinux-dbgXX  vmlinux

### Kernel with debug symbols is now in vmlinux.
### Stripped kernel for netbooting or CompactFlash is now in vmlinux-dbgXX
```

5.3.2 Build the Patched Linux Kernel

Install the XLR kernel source RPM from Continuous Computing

6. Copy /opt/rmi/x.x/linux/src to a working directory (where x.x is the version).
7. Apply the Continuous Computing patch file to your RMI Linux kernel source.
8. Set your path with the appropriate cross-compile tool chain. If you wish to change settings in the configuration, run "make menuconfig."

9. Run "make vmlinux". This will produce a kernel with full debugging information.

For booting through the network or CompactFlash, you will need to strip the kernel using the cross-tool strip utility. For example, use the following script to build the kernel:

```
exportPATH=$PATH:/opt/rmi/x.x/mipscross/crosstool/gcc-3.4.3-\
glibc-2.3.6/mipsisa32-xlr-linux/bin

make vmlinux

echo "Stripped kernel is named vmlinux-dbgXX"
mipsisa32-xlr-linux-strip -o vmlinux-dbgXX vmlinux
```

5.4 Cross Compiling Linux Applications using the RMI SDK Crosscompiler

Please refer to section 1.1, *Tool Chains* of the *RMI SDK Manual* for details on various cross compiler options available for RMI Linux. In short, if you want to cross compile a linux application on your development server, add the following line in the makefile.

```
CC=/opt/rmi/1.4/mipscross/crosstool/gcc-3.4.3-glibc-2.3.6/mipsisa32-xlr-linux/
bin/mipsisa32-xlr-linux-gcc

It points to gcc cross compiler (example here is for SDK 1.4)
```

6

Booting the XLRs

XLRs are booted with either Linux or an RMIOS application. Consequently, booting procedures depend upon whether the RMIOS application or Linux is used. This chapter summarizes those boot up methods as well as Continuous Computing's extension which adds flexibility and automation of to the booting procedure.

If booted with Linux, the root file system can be either in a ramdisk or a NFS server.

This chapter focuses on the boot methods (NFS or compact flash) and how to automate bootup.

This chapter only summarizes XLR boot steps. For more details please see the RMI's SDK documentation available from Continuous Computing or RMI on request.

6.1 XLR Boot Methods

In PP50s, each of the XLR is booted independently. Essentially, XLR can be booted via network or compact flash.

6.1.1 Network Boot

This section describes network boot methods.

6.1.1.1 Boot Server setup

Network boot involves setting up servers that will hold the software needed to boot XLR.

Servers	Reason
TFTP	Needed to ftp either RMIOS application or Linux kernel.
NFS	Needed from file system if Linux is booted. If Linux is run entirely out of ramdisk, this will not be needed.
DHCP	If auto configuration of IP address, mask or gateway is desired.

Note that all the servers can be on same or different machine in network.

6.1.1.2 PP50 Setup

In order to access software (kernel, RMIOS application, file system) during boot procedure the XLR should connect to boot server(s).

Either the PP50 **front panel 1GbE**, or **base network 1GbE** can be used for this purpose.

Table 6-1: Network Boot Options

Network Boot Type	Recommended Application	XLR GMAC #
Front Panel 1GbE port of XLR.	Initial lab experimentation. Used in deployment if boot network needs to be separate from the ATCA base and fabric networks for some reason.	GMAC0. PP50 front panel 1GbE port for XLR should be connected to the network with boot server.
Network Boot from 1GbE ATCA base network one or two.	Lab experimentation and deployment.	GMAC2 (base channel A) and GMAC3 (base channel B). [a]

a. Install a functioning ATCA switch into hub slot in your ATCA chassis. If GMAC2 is used, switch should be present in slot that has access to base channel A. Similarly for GMAC3, switch should have access to base channel B. Switch should be configured and connected to the network with boot server.

6.1.1.3 Network Boot Example

To boot from a network port, use the "ifconfig" and "tftpc" bootloader commands. An example of booting from the network on front panel 1GbE (gmac0) is shown below. The example illustrates down loading Linux kernel and booting XLR.

Note: Ignore the initial "tftpc stall" message.

```
PP50-1 $ ifconfig -i gmac0 -a 172.17.69.5 -n 255.255.0.0 -g 172.17.0.254
ipaddr: 172.17.69.5
netmask: 255.255.0.0
gateway: 172.17.0.254
PP50-1 $ Starting Network interface "gmac0"
PP50-1 $ tftpc -s 172.16.0.168 -f pp50/vmlinux-pp50
Server IP : 172.16.0.168
File : pp50/vmlinux-pp50
PP50-1 $ tftpc stall, check network setup
Bytes downloaded: 9651512
tftpc: download done. size = 9651512 @ address 0x8c2ad9d0
PP50-1 $ elfload
PP50-1 $ userapp hda=noprobe
```

Similar commands can be used to boot and run Linux kernels or RMIOS applications. Please see the RMI SDK guide for more details.

6.1.2 XLR Bootloader Commands

Below is a summary of XLR bootloader commands for reference. It is RMI SDK 1.5.5 based.

```
PP50-1 $ help
-------------------
Available Commands:
-------------------
arp                          - display current arp table
autoboot                     - execute autoboot sequence
bk_update                    - erase & program the backup bootloader
boardrev                     - print board version number
boot_erase                   - erase 2MB boot section of selected flash
boot_mode_get                - get boot mode
boot_update                  - erase & program the bootloader
bunzip2                      - run bunzip2 on 'bootfile'
checksum                     - MD5 checksum calculator
clearenv                     - reset env. variables to default values
cpld_write                   - configure the register of cpld
cplddump                     - print cpld reg.values
cpldrev                      - print board cpld version
cpldump                      - print cpld reg.values
cpuinfo                      - prints COP-0, (I/D)-Cache and CPU# info
cpustatus                    - print summary of active CPUs
diag                         - do some diagnoses
dinfo                        - info on detected storage devs/controllers
dload                        - load file from disk into mem
dls                          - run 'ls' on selected storage device
elfload                      - validate elf file and load into mem
enable_debug                 - currently enables GMAC debug
env                          - display current env. variables
flerase                      - erase all or part of onboard flash chip(s)
flinfo                       - display onboard flash chip(s) details
flprog                       - program all or part of onboard flash chip(s)
fsinfo                       - display JFFS2-partition info
gmac_cfg                     - configure the gmac interface
gmac_dump_phy_regs           - list GMAC PHY registers
gmac_phy_write_reg           - program selected GMAC PHY registers
gphy                         - read & write the register of gphy
h                            - alias for 'help'
help                         - display this help menu
hist                         - display previous commands (max. 64)
ifconfig                     - bringup selected eth interface
iobus                        - print iodevice-subsytem mappings
kuseg_mem                    - display available KUSEG mem
kuseg_meminfo                - available KUSEG Regions
kv                           - set key value
listpost                     - list post items
ls                           - display 'bootfile' info
memrd                        - read physical address space
memwr                        - write to physical address
multiboot                    - boot from multi device
nmiconf                      - configure loaded image from the NMI-mapped area
nmiload                      - load image to NMI mapped area
ping                         - ping through active eth interface
post_err                     - list post error codes
print_physmap                - display board's phys. memory map
printenv                     - display current env. variables
```

```
psb_info                     - display contents of global 'psb_info' struct
reboot                       - reboot the board
reg                          - read & write the register
regrd                        - display Reg. Values from IOBASE
regwr                        - change IOBASE Reg. Values
rollboot                     - switch flash bank and reboot
run                          - load elf file, call command 'userapp'
saveenv                      - save env. variables into non-volatile mem
savenv                       - save env. variables into non-volatile mem
setenv                       - assign value to env. variable
showboot                     - show flash bank
stop_vcpu                    - stop running selected vCPU
tftpc                        - start tftp client
tlbinfo                      - identify current, print all 16 TLB info
userapp                      - launch kseg0 application on XLR0
userapp_mask_cpus            - set active-cpu bitmask
userapp_noreset              - do not reset msgring0/gmac0 for 'userapp'
userapp_os                   - launch kuseg application(s)
version                      - print bootloader version info
xgm                          - read & write the xgm interface
xgphy                        - read & write the register of xphy
xlr_reserve_mem              - reserve a block of physical memory
PP50-1 $
```

6.1.3 Compact Flash Boot

Each XLR in a PP50 has access to a dedicated Compact Flash (CF). Booting from a Compact Flash eliminates the need for boot servers. To boot from a CF you must format it and then store the necessary files (Linux kernel, RMIOS application, file system etc) needed to boot the XLR.

If you are running Linux, you may include your application on the ramdisk if it is small, otherwise you can put it in a live file system on the CompactFlash card or use an NFS root.

The CompactFlash card can range from very small (16MB) to hold just an RMIOS application image, up to very large (2GB and greater) containing redundant live Linux file systems.

6.1.3.1 Formatting Compact Flash

A CF card may use either FAT or EXT2 file system. This section provides one example of formatting CF from linux in XLR.

1. Boot Linux in XLR.

```
ifconfig -i gmac2 -a 192.168.200.200 -g 192.168.70.1 -n 255.255.0.0
tftpc -s 192.168.70.20 -f pp50-linux-kernel-vX.X.Xb00
elfload
userapp ip=192.168.200.200:192.168.70.20:192.168.70.1:255.255.0.0::eth2:off
console=ttyS0,38400
```

2. Zero out the CF to ensure its integrity.

```
dd if=/dev/zero of=/dev/hda bs=512 count=1
```

3. Format the CF and mount it.

```
fdisk /dev/hda
<fdisk is interactive so these are entered sequentially>
n, p, 1, enter, enter, p, w
mkfs /dev/hda1
mkdir /cf
mount /dev/hda1 /cf
```

4. The relevant files can be copied to CF.

6.1.3.2 Booting from Compact Flash

RMI SDK provide details of the boot command used to boot Linux or RMIOS from Compact Flash. This section summaries the instructions to boot Linux from Compact Flash (CF) card.

1. Copy the Linux kernel file (for example, vmlinux-p2-dbg03) to the CF card. Root file system, if needed, should also be copied in CF.
2. Insert the CF card into pp50 p2 board and bootup.
3. Get disk and partition information.

```
PP50-0 $ dinfo print
List of IDE disks found:
                Disk: pcmcia_1 Controller: pcmcia
                =======================================
                Model: LEXAR ATA FLASH
                Firmware: V1.00 Serial#: 11014182459999090004
                Capacity: 983.8 MB = 0.9 GB (2014992 x 512)
                Partition Table.
                -----------------
                1               63         2014929      b
 PP50-0 $
```

According to above, the disk name is pcmcia_1, the partition the number is 1.

4. List CF card operation commands

```
PP50-1 $ dls
Filesystem Commands
dload <disk> <partition> <file> [bytes] - Load the specified number of [bytes]
from <disk> <partition> <file> to memory.
If [bytes] is omitted, then the value of bytes will be the size of file or 15MB,
whichever is less.

dls <disk> <partition> [directory] - list the files from <disk> <partition> [dir]
PP50-1 $
```

5. List the CF card files

```
PP50-1 $ dls pcmcia_1 1
Listing / directory.
       0   thisiscompactflash
    3139   testcmd.txt
 9684280   vmlinux-p2-dbg03
 3910938   vmlinux-wr05

4 file(s), 0 dir(s)
PP50-1 $
```

6. Load file vmlinux-p2-dbg03 to memory.

   If the CF is formatted to FAT run:

```
PP50-1 $ dload pcmcia_1 1 vmlinux-p2-dbg03
```

   If the CF is formatted to ext run:

```
PP50-1 $ dload pcmcia_1 1 /vmlinux-p2-dbg03
```

7. Load the elf file

```
PP50-1 $ elfload
```

8. Boot RMI Linux

```
PP50-1 $userapp hda=noprobe hdb=noprobe
```

6.2 Automating XLR boot

Booting the XLR, either from a network or compact flash, requires users to execute a set of commands from XLR bootloader prompt. This section describes the two methods of automating execution of those commands: Section 6.2.1, "Continuous Computing Multiboot" and Section 6.2.2, "Autobooting Using Environment Variables".

Following are two methods to automate the execution of boot commands. Continuous Computing multiboot is a more comprehensive feature that ties XLR boot to the overall management of PP50 board in a chassis.

6.2.1 Continuous Computing Multiboot

Continuous Computing's Multiboot provides several useful features for booting XLRs:

- Allows specification of multiple boot methods (network with or without DHCP, compact flash) and their relative preferences.
- Allows control of the XLR boot sequence though IPMI. This is important because it no longer requires access to the XLR bootloader to modify the boot sequence.
- Provides a mechanism to recover from failed boot attempts.

6.2.1.1 Key Values (KV)

Key values are environment variables set in the IPMC to be accessed by the XLR bootloader. The Multiboot feature is implement by the user setting up the KV variables needed for XLR boot in IPMC. Every time bootloader starts, it will read relevant variables and perform required functionality. Following are the list of KV variable needed for multiboot, following section will detail syntax and semantics for each on the set.

KV Variable	Note
sX_bootXdevX	Specific the boot device. Examples include network with dhcp, network without dhcp, compact flash.
sX_bootXfileX	bootfile name. Examples are Linux kernel, rmios application.
sX_bootXcmd	Command to boot image. Examples are "elfload" and "userapp" to boot Linux image or rmios application.
sX_bootXargsX	Arguments to boot command, if any. Example are "hda=noprobe" for Linux boot.

6.2.1.2 KV Variable Syntax

The complete name of KV variable in above table is derived by replacing the "X" with appropriate values as defined here.

CPU name

There are separate KV variable for XLR0 and XLR1. The XLR0 variables start with s0_* and XLR1 variables with s1_*

Boot method

As explained in next section, users can specify maximum of 4 boot methods to be used in sequence (if last one failed) to bring up XLR. The second "X" in KV name represents the boot method. For example, in XLR0 the set of variable that control first boot method are s0_boot0devX, s0_boot0fileX, s0_boot0cmd, s0_boot0argsX.

Size Limitation

Each of KV variable is a string. The maximum size of string is limited to 32 characters. Last "X" in the KV variable name is used add more KV variable to represent a string > 32 characters. Please note that sX_bootXcmd does not have this extension feature, all boot commands must fit into 32 characters.

Example

To set XLR0's first boot method to be "network with static IP" use the command:

PP50-0 $ kv **s0_boot0dev0** "gmac0:10.4.69.10:255.255.0.0:"

PP50-0 $ kv **s0_boot0dev1** "10.4.0.254;end"

Note: The end of string is indicated by the flag string ";end".

Note: Even if the string is less than 32 characters, user should still use s0_boot0dev0 variable and add ";end" in the end.\

For the boot device variable, there can be a maximum of **2** extensions. This means that the range of last X is {0 . . 1}.

Similarly for boot file variable, there can be 4 extensions and for the boot arguments variable there can be 8 extensions.

All characters in KV variables are case sensitive.

6.2.1.3 Access to Multiple Boot Method

The multiboot method allows users to specify multiple boot methods to be tried in a given sequence. For example, the user can set “network with dhcp” as the first option to boot XLR, “network with static IP” as second option in case DHCP server is down and so on. The bootloader will start with first method, if it fails to bring up the board it will try the next method and so on. The user can specify up to four such boot methods.

The bootloader decides a boot method has failed based on the watchdog mechanism explained in Section 6.2.1.8, "Watchdog Feature". If the watchdog timer expires, it will use the next boot method in sequence.

6.2.1.4 Boot Method Syntax

Following table lists the syntax of KV variable **sX_bootXdevX** that specifies the boot method.

Syntax	Boot Source	Note
gmacN:IP[:mask][:gateway]	(static IP)	Select the boot GMAC port and specify the static host IP address to be used.
gmacN:dhcp_only	(dynamic IP)	Host IP address is requested from DHCP server.
gmacN:dhcp_tftp	(dynamic IP)	Host IP address, gateway, TFTP server and boot file name are requested from DHCP server. Note that in this case user does not have to specify sX_bootXfileX variable.
cflash:partition	(CF card boot)	CF card as boot device, the partition field is the partition number.

Since colon(':') is used in the syntax of string, it can't be used in directory or file name.

For example, network boot using gmac2 and DHCP for second boot method in XLR1.

```
PP50-1 $ kv s1_boot1dev0 “gmac2:dhcp_only;end”
```

Following are other examples strings for static IP allocation.

- gmacN:IP;end (no mask, no gateway)
- gmacN:IP:mask;end (with mask, no gateway)
- gmacN:IP: :gw;end (no mask, with gateway, note: one space must be added between “IP” and “gw”)
- gmacN:IP:mask:gw;end (with mask, with gateway)

6.2.1.5 Specifying Boot file

Next KV variable after boot method is path/name of the boot file. In case of network boot method, the path of file is prefixed with IP address of the boot server that holds the boot file and runs TFTP server. The boot files usually are Linux kernel image or RMIOS application image.

6.2.1.5.0.1 Syntax of Boot File

The following table lists the syntax of KV variable **sX_bootXfileX** that specifies the boot file.

Syntax	Boot Method	Note
<tftp server>:<file>	network	IP of TFTP server and boot file name in the server.
<file>	compact flash	boot file name in compact flash.

Following example shows setting up pp50/images/pp50-linux-kernel-v2.2.3b01 file as boot file in XLR0, boot method 1 using network boot.

```
PP50-0 $ kv s0_boot0file0 "10.4.69.69:pp50/images/"
PP50-0 $ kv s0_boot0file1 "pp50-linux-kernel-v2.2.3b01;end"
```

Setting up pp50/images/pp50-linux-kernel-v2.2.3b01 file as boot file in XLR0, boot method 4 using compact flash.

```
PP50-0 $ kv s0_boot3file0 "pp50/images/"
PP50-0 $ kv s0_boot3file1 "pp50-linux-kernel-v2.2.3b01;end"
```

6.2.1.6 Specifying Boot command

Next KV variable after boot file is the boot command string. Please refer to RMI SDK for syntax and semantics of boot command. Essentially boot command string consists of XLR bootloader commands to load and boot the XLR.

6.2.1.6.0.2 Syntax of Boot command

The KV variable used for boot command is sX_bootXcmd**.**

Boot command to boot a Linux or RMIOS KUSEG image.

```
PP50-0 $ kv s0_boot0cmd "elfload;userapp"
```

Notice the absence of last “X” in KV variable and the absence of “;end” string in the end. One key should be enough for the bootcmd argument in any kind of logical boot device. Multiple boot commands can be combined with semicolon (";") as list separator.

6.2.1.7 Specifying Boot Arguments

Next KV variable after boot command is the boot command arguments. Please refer to RMI SDK for syntax and semantics of boot command arguments.

6.2.1.7.1 Boot Argument Syntax

The following example sets the KV boot argument variables as shown in the table below it:

"hda=noprobe hdb=noprobe root=/dev/nfs nfsroot=10.3.8.23:/rmi/1.4/nfsroot

ip=10.4.69.11:10.3.8.23:10.4.0.254:255.255.0.0::eth2:off console=ttyS0,38400"

```
PP50-0 $ kv s0_boot0args0 "hda=noprobe hdb=noprobe "
PP50-0 $ kv s0_boot0args1 "root=/dev/nfs nfsroot="
PP50-0 $ kv s0_boot0args2 "10.3.8.23:/rmi/1.4/nfsroot "
PP50-0 $ kv s0_boot0args3 "ip=10.4.69.11:10.3.8.23:"
PP50-0 $ kv s0_boot0args4 "10.4.0.254:255.255.0.0::eth2:"
PP50-0 $ kv s0_boot0args5 "off console=ttyS0,38400;end"
```

6.2.1.8 Watchdog Feature

Users can specify four four methods of booting: regular boot, boot file, boot command, and boot args in a sequence as part of Continuous Computing’s multiboot. XLR bootloader will start with last tried boot sequence and, if it fails to boot XLR, it will continue with next method in sequence.

The decision as to when a boot sequence is considered to have “failed” to bring up the XLR is based on the **watchdog timer.** The following are important points to consider regarding the watchdog timer.

- At the start of each boot sequence, XLR bootloader will tell the IPMC to start watchdog timer. The value of watchdog timer is controlled by KV variable **sX_bootwd.**
- If the timer times out, IPMC will consider boot sequence as failure as will reboot XLR. Once the reboot is finished the XLR will continue with next boot method in sequence.

- If the boot method is successful, **it is the responsibility of booted entity to stop the watchdog timer in IPMC**. Failure to do so will result in IPMC rebooting XLR. Currently, if XLR is booted to Linux, user can add a utility called “ipmi_setwd” as part of their root file system. Calling this utility, preferably from init scripts, will reset the watchdog timer in IPMC. Currently, there is no such utility available for RMIOS application.
- The watchdog feature can be disabled by setting value of **sX_bootwd** to 0. In this case user have to manually reboot XLR to continue with next boot sequence.

It is important to set the right value for watchdog timer. The value should ideally be largest of the time it take to boot XLR for each sequence. Given that booting Linux takes most time, the timer value can be set based of Linux boot time. Typically it takes about 60 seconds to boot the RMI Linux or WindRiver Linux kernel on PP50, so 70 is a good value to start with.

Example of setting watchdog timer.

```
PP50-0 $ kv s0_bootwd  "70"
```

To find which payload stage's watchdog timer expired run the following command:

```
cat /var/log/messages | grep expired
```

6.2.1.8.2 Stopping Watchdog Timer in Linux

As noted above after a successful boot, the watchdog timer must be stopped. Linux provides the “ipmi_setwd” utility which can perform this operation (present in *Utilities* directory in release).

For booting RMI linux kernel from its own RAM FS

- The binary of RMI Linux kernel with version later than "v2.2.3b00" has included this utility as part of ramdisk.
- For kernel version less that "v2.2.3b00" user has to rebuild kernel and add this utility as part of initramfs.

For booting linux from nfsroot you need to add “ipmi_setwd” in /usr/bin of the nfsroot and set it as executable using the "chmod a+x ipmi_setwd" command.

You must also add following line in the nfsroot script file /etc/inittab,

```
0:12345:once:/usr/bin/ipmi_setwd 0
```

6.2.1.9 Initializing Multiboot

Multiboot is initialized by setting kv entries as described below.

6.2.1.9.3 Setting the s[0_1]_multiboot Key Value

Specify the way of XLR multiboot/autoboot through setting the s[0|1]_multiboot KV key.

KV key s[0|1]_multiboot =

1 - Try to boot from KV key boot0dev (similar to "multiboot -s 0")

2 - Try to boot from KV key boot1dev (similar to "multiboot -s 1")

3 - Try to boot from KV key boot2dev (similar to "multiboot -s 2")

4 - Try to boot from KV key boot3dev (similar to "multiboot -s 3")

5 - Try to boot from KV keys boot0dev through boot3dev (similar to "multiboot -s a")

10 - Try to boot using the XLR's environment variables - bootcmd0 through bootcmd9

20 - Do not auto boot, force to bootloader prompt regardless of environment variables and Key-Value settings

Unsupported value - Display this usage information and force to bootloader prompt

---

Note: If KV key s[0|1]_multiboot is not set or deleted, XLR will auto boot using the environment variables (bootdelay, bootcmd0 through bootcmd9), which is as same as chapter 6.2.2 said.

6.2.1.9.3.1 Setting the s[0|1]_bootdelay Key Value

Specify the waiting time before starting multiboot/autoboot through setting the KV key s[0|1]_bootdelay.

s[0|1]_bootdelay =	0	- boot with no waiting
	< 0	- do not boot and force to bootloader prompt
	> 0	- start to boot after the set time (seconds)

Note: If the kv key s[0|1]_bootdelay is not set or deleted, it will be handled as if the default value '-1' was set and will force the bootloader prompt.

Note: If the kv key s[0|1]_bootdelay is set to a wrong value by mistake, it will boot with no waiting.

6.2.1.10 Multiboot Example

The following examples show three boot sequences for XLR0.

Initialize multiboot feature

```
kv s0_bootmode "normal"
kv s0_bootwd 70
kv s0_multiboot 5
kv s0_bootdelay 3
```

Sequence 1: Multiboot using GMAC0 and static IP

```
kv s0_boot0dev0 "gmac0:10.4.2.2:255.255.0.0;end"
kv s0_boot0file0 "10.4.3.69:pp50-linux-kernel"
kv s0_boot0file1 "-v2.2.3b00/"
kv s0_boot0file2 "pp50-linux-kernel-v2.2.3b00"
kv s0_boot0file3 ";end"
kv s0_boot0cmd "elfload;userapp"
```

Sequence 2: Multiboot using GMAC0 and DHCP and TFTP option

```
kv s0_boot1dev0 "gmac0:dhcp_tftp;end"
kv s0_boot1cmd "elfload;userapp"
```

Sequence 3: Multiboot Using GMAC0 and DHCP for IP address

```
kv s0_boot2dev0 "gmac0:dhcp_only;end"
kv s0_boot2file0 "10.4.3.69:pp50-linux-kernel"
kv s0_boot2file1 "-v2.2.3b00/"
kv s0_boot2file2 "pp50-linux-kernel-v2.2.3b00"
kv s0_boot2file3 ";end"
kv s0_boot2cmd "elfload;userapp"
PP50-0 $ reboot
```

6.2.2 Autobooting Using Environment Variables

User can also use RMI “bootcmd” environment variables to specify a sequence of commands to be executed by bootloader. Note that this method of automating XLR boot sequence is not as comprehensive as Continuous Computing autoboot feature. It requires users access to XLR bootloader and does not provide flexibility to try multiple boot methods in sequence. Please refer to RMI SDK for more details on this feature.

6.3 XLR Utility

Continuous Computing has added a set of commands to simplify Linux booting and management procedures. Some are available from the bootloader before Linux runs: Section 6.3.2, "XLR Commands Available From the BootLoader", others are available after Linux runs; Section 6.3.3, "XLR Commands Available From Linux".

6.3.1 Installing Linux Utilities

These utilities are in the release package's in "Utilities" directory. They are already part of ramfs, but if nfsroot is used the following steps must be performed to get these utilities in nfsroot.

6.3.1.1 RMI Linux

1. Get the NFS package from RMI SDK and unpack it.
2. Copy the files to the NFS root.
3. Utilities directory to bin directory in nfsroot.

```
root # mkdir Utilities
root # tar -xzvf pp50-xlr-utils-vx.x.xr00.tgz -C Utilities
root # cp Utilites/kv <NFS dir>/bin/
root # cp Utilities/getcpuid <NFS dir>/bin/
root # cp Utilities/net_config <NFS dir>/etc/rc.d/init.d/
```

4. Create link for net_config

```
root#  cd <NFS dir>/etc/rc.d/rc2.d/
root#  ln –s ../init.d/net_config S31net_config
root#  cd <NFS dir>/etc/rc.d/rc3.d/
root#  ln –s ../init.d/net_config S31net_config
root#  cd <NFS dir>/etc/rc.d/rc4.d/
root#  ln –s ../init.d/net_config S31net_config
root#  cd <NFS dir>/etc/rc.d/rc5.d/
root#  ln –s ../init.d/net_config S31net_config
```

6.3.1.2 WR Linux

The script and relative utilities have been integrated into the BSP for Wind River PNE Linux, but for additional changes, please refer to the Section 9.3, "Building the Kernel and NFS" for more information.

6.3.2 XLR Commands Available From the BootLoader

The commands in this section are included in the XLR and IPMC firmware and are used to boot the XLR.

6.3.2.1 kv

Sets a key value in the database. See Section 7.4, "Key Value (KV) Database" for details.

Detail	Description
Synopsis	kv [key [value]]
Options	-k prints entries in shell-compatible syntax. -V display version of kv utility. -h display command usage. -d delete a key from database.

Examples	`xlr prompt] kv`
	`  ipmc_version = "pp50-ipmc-v2.4.3r00"`
	`      datetime = "2009-04-29 23:20:42"`
	`     epochtime = "1241047243"`
	`      xlr0base = "00:02:BB:50:32:90"`
	`      xlr1base = "00:02:BB:50:32:98"`
	`  pyld0_compat = "8.2"`
	`  pyld1_compat = "8.2"`
	`        hwaddr = "43"`
	`   f1_presence = "1"`
	`   f2_presence = "0"`
	`    __pwr_regs = "ff00000000000000"`
	`      __f0_poh = "770"`
	` __s0_rstcause = "cold_reset"`
	`  __s0_rsttime = "2009-04-29 23:07:31"`
	` __s1_rstcause = "cold_reset"`
	
	`[xlr prompt] kv -V`
	`kv version 1.1`
	
	`[xlr prompt] kv hello there`
	`[xlr prompt] kv hello`
	`         hello = "there"`
	`[xlr prompt] kv -d hello`
	`[xlr prompt] kv hello`
	`Key 'hello' not found`

6.3.2.2 showboot

Shows the bank where the bootloader booted from (xlr active flash bank id).

Detail	Description
Synopsis	showboot
Options	no options
Examples	[xlr prompt] showboot System was booted from bank 0. The active bank version is: v2.5.0r00

6.3.2.3 rollboot

Switches to the other flash bank and boots.

Detail	Description
Synopsis	rollboot
Options	none
Example	[xlr prompt] rollboot System was booted from bank 0. The active bank version is: v2.5.0r00 Rollboot to bank 1...

6.3.3 XLR Commands Available From Linux

The following commands are available after the XLR has booted WR/RMI Linux.

6.3.3.1 NTP client

The Network Time Protocol (NTP) daemon synchronizes RMI Linux time with NTP servers. Please refer to README file in NTP directory of Utilities package for more on installation.

6.3.3.2 kv

See Section 6.3.2.1, "kv" for details.

6.3.3.3 showboot

See Section 6.3.2.2, "showboot" for details.

6.3.3.4 rollboot

See Section 6.3.2.3, "rollboot" for details.

6.3.3.5 ipmi_setwd

IPMI Set WatchDog timer, reboots the XLR based on the time specified; supports XLR multiboot feature. For details about its usage also see Section 6.2.1.8, "Watchdog Feature".

Detail	Description
Synopsis	ipmi_setwd [-hv][seconds]
Options	-h help -v display version seconds(decimal) = 0 stops the watchdog timer seconds(decimal) > 0 starts the watchdog timer
Examples	[xlr prompt] ipmi_setwd 22

6.3.3.6 fswcmd

Fabric Switch Command, provides fabric switch operation from the XLR side. See Section 8.2.1, "Managing the Fabric Switch with fswcmd" for details.

6.3.3.6.1 fswcmd.cfg Configuration File

A small configuration file named fswcmd.cfg included in the release package provides the address for the IPMC to ensure it can be accessed; for example, if the accessible IPMC interface IP address is 10.4.1.10, the following line should be in the fswcmd.cfg

```
ip_address 10.4.1.10
```

This config file indicates where the fabric switch daemon 'fswd' is. This file is required only when the fswcmd is executed on the XLR (RMI Linux or WindRiver Linux).

Note this is not be confused with the fswitchCfg.def file and its associated kv key fswitchCfg. See Section 8.2, "Fabric Switch Management" and Section 8.2.2, "fswcmd Start Up File" for more details.

6.3.3.7 upgrade

For upgrading the xlr flash bank

Detail	**Description**
Synopsis	upgrade <-a | -s> [options]
Options	? Display this usage -V Display version of this program -a Use active flash for operation -s Use backup flash for operation -b <backup file> Backup flash info to a file -p <program file> Program file to flash -v <program file> Verify flash info with a file
Examples	To backup: [xlr prompt] ./upgrade -a -b bootloader.bck To program: [xlr prompt] ./upgrade -s -p bootloader.bin To verify: [xlr prompt] ./upgrade -s -v bootloader.bin

6.3.3.8 bswcmd

The bswcmd command provides base switch operation and information. See Section 8.6, "CNode Base Switch (bswcmd) Command" for more information about this command.

6.3.3.9 getcpuid

Returns the XLR CPU ID of the XLR you are currently using.

Detail	**Description**
Synopsis	getcpuid
Options	None
Examples	[root@localhost xlr-utils]$ ./getcpuid xlr cpu id is: 0

6.3.3.10 net_config

Configures the network interface using the KV keys in the database. It replaces setkv.

Detail	Description
Synopsis	net_config {start|stop|restart|reload|status}
Options	{start|stop|restart|reload|status}
Examples	[xlr prompt] ./net_config stop [xlr prompt] ./net_config restart [xlr prompt] ./net_config reload [xlr prompt] ./net_config start Auto configure network from kv database... [OK] [xlr prompt] ./net_config status

6.3.3.11 ipmi_setwd

Sets watchdog for supporting the XLR multiboot feature.

Usage: ipmi_setwd [-hv][seconds]

where:

-h help

-v display version

seconds(decimal) = 0 stops the watchdog timer

seconds(decimal) > 0 starts the watchdog timer

6.3.3.12 ux_diag

Diagnostic management utility based on kv schema.

Usage:

```
[Linux Prompt]$ ./ux_diag -h
usage: ux_diag [-u|--update] [cn|s0|s1]
usage: ux_diag [-l|--list] [cn|s0|s1]
usage: ux_diag [-d|--dump] [cn|s0|s1]
usage: ux_diag [-n|--no] [cn|s0|s1]
usage: ux_diag [-h]
    -u  update diagnosis configuration using /etc/diag/XX_diag.cfg
    -l  list all available test items and test states configuration
    -d  dump the test result and create /var/log/XX_diag.dump
    -n  list current diagnosis test error number and err string
    -h  for help
```

7

Intelligent Platform Management Controller

This chapter describes the Intelligent Platform Management Controller (IPMC) on the PP50. The PP50 implements IPMC module on a Linux based system using a PPC405EZ processor. This processor is referred to as the CNode. Apart from the IPMC module, the CNode also runs various other modules to control the base and fabric switches on a PP50. This chapter concentrates on the IPMC module.

The IPMC module is a single threaded, user level daemon process (ipmcd) running on the CNode. This daemon process is started using one of the startup scripts on Linux.

Following are the main functions of the IPMC module:

- Provides an interface to Shelf Manager over IPMB channel for the management of the blade as per PICMG 3.0 Revision 2.0 AdvancedTCA Base Specification and IPMI v1.5 specification.
- Provides an interface to the payload CPUs over the SIPL channel.
- Provides an interface to the System Manager using RMCP over base interface ethernet.
- Provides an interface to switch management applications for E-Keying.

7.1 FRU Support

The PP50 IPMC provides two managed FRUs:

- Front Board (FRU # 0)
- RTM (FRU # 1)

There is also one unmanaged FRU, the TCAM (FRU # 2).

The front board FRU acts as the master FRU, meaning other FRUs cannot be made active unless front board FRU is active. Similarly, if the front board FRU is deactivated then other slave FRUs are automatically deactivated.

Managed FRUs are visible to the shelf manger (and system manager) for all the management purposes including its activation and deactivation. Unmanaged FRUs are activated and deactivated by the front board FRU itself during the master FRU’s activation and deactivation.

Note: When installing and removing RTMs, ensure they are securely attached to the chassis by tightening the thumb bolts. Failure to do so may result in improper board behavior.

Optionally, the IPMC also provides the flexibility to create one managed FRU for each of the XLRs using the KV key "xlrfru". Please refer to Table 7-5 "Key Value Database" for description of KV key "xlrfru". By default, IPMC does not create a managed FRU for XLRs and rather each of the XLRs are payloads of Front Board FRU only. When a managed FRU for each of the XLRs are created, the IPMC creates the following additional FRUs:

- FRU # 3 for PP50-P2 XLR0
- FRU # 4 for PP50-P2 XLR1

Even though, the IPMC creates a managed FRU for each XLR, the XLRs are not actual field replaceable unit and so having a managed FRU for them is purely for management purposes only. For the same reason, the IPMC does not create and maintain any separate FRU data for XLR FRUs and so "Read FRU Data" commands for XLR FRU returns FRU data of Front Board FRU only and "Write FRU Data" command is not applicable for XLR FRUs.

7.1.1 FRU State

PICMG 3.0 defines a standard FRU state machine to allow controlled introduction and removal of hardware to and from a running system. All the managed FRUs on the PP50 follow the state machine defined by PICMG specifications. Managed FRUs require a management activation from shelf (and/or system) management; they do not become active without an interaction with shelf (and/or system) management application.

Managed FRU's state machine is affected by events from shelf (and/or system) management, ejector latches, hardware presence detection, and other timers or behaviors internal to the IPMC.

7.1.2 FRU Hot swap Sensors

For each managed FRU, the PP50 provides a FRU Hotswap Sensor as defined by the ATCA specification to indicate FRU state (M0-M7). Hotswap sensor can be enabled to provide notification via sensor events any time the hot swap state of that FRU changes.

For unmanaged FRU (TCAM), PP50 provides a Presence Sensor which can be queried to detect presence of the FRU.

Note: There is no guaranteed association between sensor numbers and FRU numbers. Therefore users are advised not to put specific sensor numbers into their management applications. Instead, the management application should rely on sensor event messages which include the FRU number as a data field, or it can read and search the sensor data records using the sensor name to look up the sensor number at run time if needed.

See Section 7.2, "Sensors" for details on all the sensor supported by the PP50.

7.1.3 FRU Data

FRU inventory data is usually accessed through the shelf manager, or remotely using HPI (Hardware Platform Interface).

The PP50 allows frudata read and write for both managed and unmanaged FRUs.

Below is an example of obtaining FRU data on a 5U chassis with a Pigeon Point-ShMC. It is an example only, your method of access and data will vary based on your shelf management and system management interface.

7.1.3.1 Example of FRU Data using Pigeon Point ShMc

In this example, the PP50 board is seated in slot 3 (IPMB address of 0x86) on Schroff 5U chassis. The command to read FRU data of front board is:

```
fruinfo 86 0
```

where:

- 86 is the IPMB address of the PP50 board and will vary depending on which slot the board occupies.

- 0 is the logical FRU number for the PP50 Front board FRU.

```
CLI> fruinfo 86 0
86: FRU # 0, FRU Info
Common Header:    Format Version = 1
Internal Use Area:
    Version = 1
Board Info Area:
    Version     = 1
    Language Code            = 25
    Mfg Date/Time            = Aug  8 02:44:00 2007 (6101444 minutes since 1996)
    Board Manufacturer       = Continuous Computing Corp.
    Board Product Name       = FlexPacket ATCA-PP50
    Board Serial Number      = 00:02:bb:50:02:00
    Board Part Number        = 0-XXXXX-NN
    FRU Programmer File ID   =

Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Continuous Computing Corp.
    Product Name             = FlexPacket ATCA-PP50
    Product Part / Model#    = PP50 0-9XXXX
    Product Version          = X00 P2
    Product Serial Number    = CT7-00578
    Asset Tag                =
    FRU Programmer File ID   =

Multi Record Area:
    PICMG Board Point-to-Point Connectivity Record (ID=0x14)
        Version = 0
CLI>
```

Command to read FRU data for PP50 RTM FRU is:

```
fruinfo 86 1
```

where:

- 86 is the IPMB address of the PP50 board and will vary depending on which slot the board occupies
- 1 is the logical FRU number for the PP50 RTM FRU

```
CLI> fruinfo 86 1

86: FRU # 1, FRU Info
Common Header:    Format Version = 1

Internal Use Area:
    Version = 1
Board Info Area:
    Version     = 1
    Language Code            = 25
    Mfg Date/Time            = Aug  8 02:44:00 2007 (6101444 minutes since 1996)
    Board Manufacturer       = Continuous Computing Corp.
    Board Product Name       = FlexPacket ATCA-PP50 RTM
    Board Serial Number      = CZ8-11539
    Board Part Number        = 0-11024-E06
    FRU Programmer File ID   =

Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Continuous Computing Corp.
    Product Name             = FlexPacket ATCA-PP50 RTM
    Product Part / Model#    = PP50 0-9XXXX
    Product Version          = X00 P2
    Product Serial Number    = CZ8-11539
    Asset Tag                =
    FRU Programmer File ID   =
CLI>
```

The command to read FRU data for PP50 TCAM FRU is:

```
fruinfo 86 2
```

where:

- 86 is the IPMB address of the PP50 board and will vary depending on which slot the board occupies
- 2 is the logical FRU number for the PP50 TCAM FRU (unmanaged FRU)

```
CLI> fruinfo 86 2

86: FRU # 2, FRU Info
Common Header:    Format Version = 1

Internal Use Area:
    Version = 1
Board Info Area:
    Version     = 1
    Language Code            = 25
    Mfg Date/Time            = Aug  8 02:44:00 2007 (6101444 minutes since 1996)
    Board Manufacturer       = Continuous Computing Corp.
    Board Product Name       = FlexPacket ATCA-PP50 TCAM
    Board Serial Number      = CZ8-19683
    Board Part Number        = 0-11761-E03
    FRU Programmer File ID   =

Product Info Area:
    Version     = 1
    Language Code            = 25
    Manufacturer Name        = Continuous Computing Corp.
    Product Name             = FlexPacket ATCA-PP50 TCAM
    Product Part / Model#    = PP50 0-9XXXX
    Product Version          = X00 P2
    Product Serial Number    = CZ8-19683
    Asset Tag                =
    FRU Programmer File ID   =
CLI>
```

7.2 Sensors

This section describes the PP50's sensors. The following table lists all the sensors available on PP50. Please refer to IPMI specification for details on sensor type, sensor class and sensor event/reading type codes.

Table 7-1: PP50 Sensor List

Sensor Name	Sensor Type	Sensor Class	Event/Reading Type Code	Sensor Description
Front Hotswap	Hot Swap	Discrete	Sensor Specific (0x6f)	FRU Hot Swap Sensor
RTM Hotswap	Hot Swap	Discrete	Sensor Specific (0x6f)	'FRU Hot Swap Sensor'
IPMB Physical	IPMB Link	Discrete	Sensor Specific (0x6f)	Physical IPMB-0 Sensors
-48V A *	Voltage	Threshold	Generic (0x01)	-48V A feed voltage.
-48V B *	Voltage	Threshold	Generic (0x01)	-48V B feed voltage.
Holdup Cap *	Voltage	Threshold	Generic (0x01)	Hold-up Capacitor Voltage (relative to -48v_out)
-48V Current *	Current	Threshold	Generic (0x01)	-48v_out current. None of the thresholds of this sensor are settable.
Pwr Module Temp *	Temperature	Threshold	Generic (0x01)	Power Module Temperature
CNODE Ambient	Temperature	Threshold	Generic (0x01)	board ambient temperature

Table 7-1: PP50 Sensor List

XLR0 FW Progress	System Firmware Progress	Discrete	OEM (0x70)	XLR0 system firmware Progress. Event reading type code of OEM (0x70) allows user application running on XLR0 to set sensor reading and events by issuing IPMI command “Set Sensor Reading and Event Status”. User application can set sensor reading value in the range 0x80 - 0xff.
XLR0 Ambient	Temperature	Threshold	Generic (0x01)	XLR0 ambient temperature
XLR0 Core	Temperature	Threshold	Generic (0x01)	XLR0 core temperature
XLR0 Watchdog	Watchdog 2	Discrete	Sensor Specific (0x6f)	XLR0 watchdog
XLR1 FW Progress	System Firmware Progress	Discrete	OEM (0x70)	XLR1 system firmware Progress. Event reading type code of OEM (0x70) allows user application running on XLR1 to set sensor reading and events by issuing IPMI command “Set Sensor Reading and Event Status”. User application can set sensor reading value in the range 0x80 - 0xff.
XLR1 Ambient	Temperature	Threshold	Generic (0x01)	XLR1 ambient temperature

Table 7-1: PP50 Sensor List

XLR1 Core	Temperature	Threshold	Generic (0x01)	XLR1 core temperature
XLR1 Watchdog	Watchdog 2	Discrete	Sensor Specific (0x6f)	XLR1 watchdog
FM2112/ FM3112 Ambient	Temperature	Threshold	Generic (0x01)	Fabric-Ethernet-switch ambient temperature
FM2112/ FM3112 Core	Temperature	Threshold	Generic (0x01)	Fabric-Ethernet-switch core temperature
TCAM Presence	Entity Presence	Discrete	Generic (0x08)	TCAM mezzanine card installed
TCAM Chip0	Temperature	Threshold	Generic (0x01)	TCAM Chip 0 temperature. Only present when the TCAM is installed.
TCAM Chip1_FPGA	Temperature	Threshold	Generic (0x01)	TCAM Chip1_FPGA temperature. Only present when the TCAM is installed.

* Sensors related to power module are only present on PP50 boards with PCBA version E08 or higher where power module unit is fully functional.

Following table lists the factory default values of thresholds and hysteresis settings of threshold sensors along with their conversion formula and accuracy settings.

Table 7-2: Factory default settings of thresholds and hysteresis

Sensor	Conver-sion	UCR	UMJ	UMN	LCR	LMJ	LMN	Hyst		Accuracy Percent
								+	-	
CNode Ambient	-	0x55	0x50	0x4B	-	-	-	2	2	98
FM2112 Ambient	-	0x55	0x50	0x4B	-	-	-	2	2	98
FM2112 Core	y=1x-15	0x64 *	0x5F	0x5A	-	-	-	2	2	97

Table 7-2: Factory default settings of thresholds and hysteresis

Sensor	Conver-sion	UCR	UMJ	UMN	LCR	LMJ	LMN	Hyst +	Hyst -	Accuracy Percent
FM3112 Ambient	-	0x55	0x50	0x4B	-	-	-	2	2	98
FM3112 Core	y=1x-3	0x6C*	0x67	0x62	-	-	-	2	2	97
XLR0 Ambient	-	0x55	0x50	0x4B	-	-	-	2	2	98
XLR0 Core	-	0x5F*	0x50	0x4B	-	-	-	2	2	97
XLR1 Ambient	-	0x55	0x50	0x4B	-	-	-	2	2	98
XLR1 Core	-	0x5F*	0x50	0x4B	-	-	-	2	2	97
Holdup Cap	y=(0.398)x	0xF3	0xEE	0xE9	0x76	0x7D	0x85	2	2	98
Pwr Module Temp	y=(1.961)x-50	0x5B	0x59	0x51	-	-	-	2	2	98
-48V A	y=(0.325)x	-	0xD4	0xCB	-	0x7B	0x84	2	2	98
-48V B	y=(0.325)x	-	0xD4	0xCB	-	0x7B	0x84	2	2	98

* Thresholds not user settable

Boards either have FM2112 or FM3112 switches, not both.

Abbreviations used in the above table are described below.

UCR: Upper Critical (IPMI non-recoverable)
UMJ: Upper Major (IPMI critical)
UMN: Upper Minor (IPMI non-critical)
LCR: Lower Critical (IPMI non-recoverable)
LMJ: Lower Major (IPMI critical)
LMN: Lower Minor (IPMI non-critical)

7.3 Link Descriptors

There are two fabric configurations for the PP50:

- 10G Fabric
- 4*1G Fabric

Following table lists the link descriptors used for the 10G fabric and 4*1G Fabric.

Table 7-3: Link Records on PP50 with 10G Fabric

#	Description	Link Grouping ID [31:24]	Link Type Exten-sion [23:20]	Link Type [19:12]	Port Flags [11:8]	Interface [7:6]	Channel [5:0]
1	Base Interface Channel 1	0000b	0000b	00000001b	0001b	00b	000001b
2	Base Interface Channel2	0000b	0000b	00000001b	0001b	00b	000010b
3	Fabric Interface Channel1 10G mode	0000b	0001b	00000010b	1111b	01b	000001b
4	Fabric Interface Channel1 1G mode	0000b	0000b	00000010b	0001b	01b	000001b
5	Fabric Interface Channel2 10G mode	0000b	0001b	00000010b	1111b	01b	000010b
6	Fabric Interface Channel2 1G mode	0000b	0000b	00000010b	0001b	01b	000010b

Table 7-4: Table 7-2: Link Records on PP50 with 4*1G Fabric

#	Description	Link Grouping ID [31:24]	Link Type Exten-sion [23:20]	Link Type [10:12]	Port Flags [11:8]	Interface [7:6]	Channel [5:0]
1	Base Interface Channel 1	0000b	0000b	00000001b	0001b	00b	000001b
2	Base Interface Channel2	0000b	0000b	00000001b	0001b	00b	000010b

Table 7-4: Table 7-2: Link Records on PP50 with 4*1G Fabric

3	Fabric Interface Channel1 1G mode (port0)	0000b	0000b	00000010b	0001b	01b	000001b
4	Fabric Interface Channel1 1G mode (port1)	0000b	0000b	00000010b	0010b	01b	000001b
5	Fabric Interface Channel1 1G mode (port2)	0000b	0000b	00000010b	0100b	01b	000001b
6	Fabric Interface Channel1 1G mode (port3)	0000b	0000b	00000010b	1000b	01b	000001b
7	Fabric Interface Channel2 1G mode (port0)	0000b	0000b	00000010b	0001b	01b	000010b
8	Fabric Interface Channel2 1G mode (port1)	0000b	0000b	00000010b	0010b	01b	000010b
9	Fabric Interface Channel2 1G mode (port2)	0000b	0000b	00000010b	0100b	01b	000010b
10	Fabric Interface Channel2 1G mode (port3)	0000b	0000b	00000010b	1000b	01b	000010b

7.3.1 PP50 with 10G Fabric Link Descriptors (shelf manager)

Below is an example of link descriptors on PP50 with 10G Fabric as reported by a Pigeon Point shelf manager.

```
Link Descriptor:
Link Grouping ID = 0x00
Link Type = 0x01 PICMG 3.0 Base 10/100/1000 Base-T
Link Type Extension = 0x0 10/100/1000BASE-T Link (four-pair)
Link Designator = 0x101 Channel1/BaseInterface/Ports0
Link Descriptor:
Link Grouping ID = 0x00
Link Type = 0x01 PICMG 3.0 Base 10/100/1000 Base-T
Link Type Extension = 0x0 10/100/1000BASE-T Link (four-pair)
Link Designator = 0x102 Channel2/BaseInterface/Ports0
Link Descriptor:
Link Grouping ID = 0x00
Link Type = 0x02 PICMG 3.1 Ethernet Fabric
Link Type Extension = 0x1
Link Designator = 0xF41 Channel1/FabricInterface/Ports0123
Link Descriptor:
Link Grouping ID = 0x00
Link Type = 0x02 PICMG 3.1 Ethernet Fabric
Link Type Extension = 0x1
Link Designator = 0xF42 Channel2/FabricInterface/Ports0123
Link Descriptor:
Link Grouping ID = 0x00
Link Type = 0x02 PICMG 3.1 Ethernet Fabric
Link Type Extension = 0x0
Link Designator = 0x141 Channel1/FabricInterface/Ports0
Link Descriptor:
Link Grouping ID = 0x00
Link Type = 0x02 PICMG 3.1 Ethernet Fabric
Link Type Extension = 0x0
Link Designator = 0x142 Channel2/FabricInterface/Ports0
```

7.3.2 PP50 with 4*1G Fabric Link Descriptors (shelf manager)

Below is an example of link descriptors on PP50 with 4*1 G Fabric reported by a Pigeon Point shelf manager.

```
Link Descriptor:
        Link Grouping ID = 0x00
        Link Type  = 0x01  PICMG 3.0 Base 10/100/1000 Base-T
        Link Type Extension  = 0x0 10/100/1000BASE-T Link (four-pair)
        Link Designator = 0x101 Channel1/BaseInterface/Ports0
    Link Descriptor:
        Link Grouping ID = 0x00
        Link Type  = 0x01  PICMG 3.0 Base 10/100/1000 Base-T
        Link Type Extension  = 0x0 10/100/1000BASE-T Link (four-pair)
        Link Designator = 0x102 Channel2/BaseInterface/Ports0
    Link Descriptor:
        Link Grouping ID  = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator = 0x141 Channel1/FabricInterface/Ports0
    Link Descriptor:
        Link Grouping ID = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator = 0x142 Channel2/FabricInterface/Ports0
    Link Descriptor:
        Link Grouping ID  = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator  = 0x241 Channel1/FabricInterface/Ports1
    Link Descriptor:
        Link Grouping ID = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator = 0x242 Channel2/FabricInterface/Ports1
    Link Descriptor:
        Link Grouping ID  = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator  = 0x441 Channel1/FabricInterface/Ports2
    Link Descriptor:
        Link Grouping ID = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator = 0x442 Channel2/FabricInterface/Ports2
    Link Descriptor:
        Link Grouping ID  = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator  = 0x841 Channel1/FabricInterface/Ports3
    Link Descriptor:
        Link Grouping ID  = 0x00
        Link Type  = 0x02  PICMG 3.1 Ethernet Fabric
        Link Type Extension  = 0x0
        Link Designator  = 0x842 Channel2/FabricInterface/Ports3
```

7.4 Key Value (KV) Database

The CNode implements a specialized Key-Value database in a serial EEPROM to store OEM parameters for configuration and control purposes. Keys can be up to 14 bytes long and the values can be up to 32 bytes long. There are several ways to manage these keys:

- By running command “kv” from ipmc-cli. See the description of “kv” in Section 7.8, "IPMC Command Line Interface" for details.
- By using IPMI OEM commands; see Section 7.5.10, "OEM API Commands" for details.
- By running utility “kv” from payloads. See Section 6.3.2.1, "kv" for usage syntax.
- By running utility “cnodekv” from CNode Linux prompt. Option “-h” lists the usage information of this utility. Any modification done by using cnodekv takes into effect only after the next restart of ipmcd daemon (and/or next restart of CNode).

7.4.1 KV Keys

This section details the KV key’s name, type, and description.

Note: "Read Only" keys should not be changed; changing them may cause the product to malfunction. "Read Only" here means that they should not be changed.

Note that some keys listed as "Read Only" in this chapter are truly read-only and cannot be written to due to IPMC protection. Other "Read Only" keys can be overwritten with the kv command, but if that is done, the product may not function properly.

Table 7-5: Key Value Database

Key Name	Type	Description
cn_fibm_enable	Read/Write	Enables FIBM Mode. See Section 8.2.3, "FIBM Mode" for details.
ipmc_version	Read Only	Provides version of IPMC firmware running on CNode. Example: pp50-ipmc-v2.4.1r00
datetime	Read Only	Provides current date and time in the format YYYY-MM-DD HH:MM:SS. Example: 2009-04-17 21:10:55

Table 7-5: Key Value Database

Key Name	Type	Description
epochtime	Read Only	Provides epoch time as a number of seconds elapsed since midnight Coordinated Universal Time (UTC) of January 1, 1970, not counting leap seconds. Example: 1240002700
s0_mac_base / xlr0base	Read Only	Provides base mac address for XLR0. Note: xlr0base will be deprecated in future releases.
s1_mac_base / xlr1base	Read Only	Provides base mac address for XLR1. Note: xlr0base will be deprecated in future releases.
f0_brd_compat	Read Only	Compatibility key for FRU # 0 (Front Board), used for internal purposes.
f1_brd_compat	Read Only	Compatibility key for FRU # 1 (RTM), used for internal purposes.
f2_brd_compat	Read Only	Compatibility key for FRU # 2 (TCAM), used for internal purposes.
hwaddr	Read Only	Provides hardware address (in hexadecimal format) assigned to the board in the chassis. Each slot in ATCA chassis is assigned an unique hardware address. Example: 44
f1_presence	Read Only	Presence of Fru # 1 (i.e. RTM). Possible values are: • 0: Fru is not present • 1: Fru is present
f2_presence	Read Only	Presence of Fru # 2 (i.e. TCAM). Possible values are: • 0: Fru is not present • 1: Fru is present
tcam_fpga_vers	Read Only	TCAM FPGA version number.
__pwr_regs	Read Only	FPGA Power registers values. These are mainly used for diagnostic and debugging purposes.
__f0_poh	Read Only	Power On hours for Fru # 0 (Front board). This is a life time counter and indicates total number of hours Fru # 0 has been in active (M4) state.

Table 7-5: Key Value Database

Key Name	Type	Description
__s0_rstcause	Read Only	Cause of last reset of payload 0 (XLR0). Possible values are: • watchdog: reset because of expiry of BMC Watchdog timer. • cold_reset: reset because of PICMG command "FRU Control (option cold reset)". • warm_reset: reset because of PICMG command "FRU Control (option warm reset)". • grace_reboot: reset because of PICMG command "FRU Control (option graceful reboot)". • diag_interrupt: reset because of PICMG command "FRU Control (option diagnostic interrupt)". • grace_shutdown: reset because of deactivation of the FRU to which this payload belongs. • unknown: payload reset because of other unknown reasons. **Note:** Currently the PP50 only supports the cold_reset and graceful reboot FRU Control commands so reset causes related to other FRU Control commands are not used as of now.
__s0_rsttime	Read Only	Date and time of last reset of payload 0 (XLR0). This value is printed in the format YYYY-MM-DD HH:MM:SS
_s0_state	Read Only	Payload 0 (XLR0) state. Possible values are: • INIT: This is the initial state for payload 0. • OSRUNNING: When the payload 0 OS is running and is capable of supporting graceful shutdown/ reboot. • SHUTDOWN: Payload 0 is processing graceful shutdown, and when the shutdown is completed, IPMC will set the value to INIT.

Table 7-5: Key Value Database

Key Name	Type	Description
__s1_rstcause	Read Only	Cause of last reset of payload 1 (XLR1). Possible values are: • pwrcycle: reset because of power cycle of the payload and/or board • watchdog: reset because of expiry of BMC Watchdog timer. • cold_reset: reset because of PICMG command "FRU Control (option cold reset)". • warm_reset: reset because of PICMG command "FRU Control (option warm reset)". • grace_reboot: reset because of PICMG command "FRU Control (option graceful reboot)". • diag_interrupt: reset because of PICMG command "FRU Control (option diagnostic interrupt)". • grace_shutdown: reset because of deactivation of the FRU to which this payload belongs. • unknown: payload reset because of other unknown reasons. **Note:** Currently the PP50 only supports the cold_reset and graceful reboot FRU Control commands so reset causes related to other FRU Control commands are not used as of now.
__s1_rsttime	Read Only	Date and time of last reset of payload 1 (XLR1). This value is printed in the format YYYY-MM-DD HH:MM:SS
_s1_state	Read Only	Payload 1 (XLR1) state. Possible values are: • INIT: This is the initial state for payload 1. • OSRUNNING: When the payload 1 OS is running and is capable of supporting graceful shutdown/ reboot. • SHUTDOWN: Payload 1 is processing graceful shutdown, and when the shutdown is completed, IPMC will set the value to INIT.

Table 7-5: Key Value Database

Key Name	Type	Description
shutdown_wait	Read/Write	This key is used for the graceful shutdown of payloads during the deactivation of the FRU. Value of this key is the maximum duration (in seconds) which IPMC waits for the payloads to shutdown gracefully and send shutdown complete event to IPMC on payload's Firmware Progress sensor. If this key does not exist then the default duration for the graceful shutdown of payloads is 120 seconds. • If shutdown_wait is 0, then IPMC immediately turns off power to all the payloads and transition the FRU to M1 state. • If shutdown_wait is < 0, then IPMC waits indefinitely for each of the payloads of the FRU to complete their shutdown. IPMC shall transition the FRU to M1 state only when it has received shutdown complete event from all the payloads of that FRU on their Firmware Progress Sensors. • If shutdown_wait is > 0, then IPMC transitions the FRU state to M1 when either it has received shutdown complete event from all the payloads of that FRU on their Firmware Progress Sensors, Or when shutdown_wait seconds have elapsed.
cn_hw_watchdog	Read/Write	Sets the hardware watchdog interval, in seconds. • Disabled by default. • Default value is 180 seconds. • If set to less than 180 seconds (too short for successful boot up) it will be reset to 180 and messages indicating it was reset will be stored in the var log. • If the key is missing or value is zero, the watchdog will be disabled.

Table 7-5: Key Value Database

Key Name	Type	Description
__cn_rstcause	Read Only	Cause of last CNode reset. Possible values are: • watchdog: reset because of expiry of IPMI Watchdog timer. • cold_reset: reset because of IPMI Cold Reset command. • unknown: reset because of other unknown reasons. **Note:** This key will show valid value only when CNode is reset due to failure of CNode Software Watchdog and/or CNode getting reset because of IPMI Cold Reset command from Shelf Manager/System Manager. In all the other cases (including running "reboot" on CNode and normal power cycle), this key will have invalid value.
__cn_rsttime	Read Only	Date and time of last CNode reset. This value is printed in the format YYYY-MM-DD HH:MM:SS **Note:** This key will show valid value only when CNode is reset due to failure of CNode Software Watchdog and/or CNode getting reset because of IPMI Cold Reset command from Shelf Manager/System Manager. In all the other cases (including running "reboot" on CNode and normal power cycle), this key will have invalid value.
ethaddr	Read Only	Base ethernet address of CNode.
ipmc_vers0	Read Only	Version of IPMC firmware in CNode flash bank # 0. Example: pp50-ipmc-v2.4.0r00
ipmc_vers1	Read Only	Version of IPMC firmware in CNode flash bank # 1. Example: pp50-ipmc-v2.4.1r00
ipmc_act_bank	Read Only	Active bank id (0 or 1) of CNode flash. This indicates ipmc firmware stored in this active bank is running currently on CNode.
s0_vers2	Read Only	version of CPLD for payload 0 (XLR0). Example: v0x08
s1_vers2	Read Only	CPLD version for Payload 1 (XLR1). Example: v0x08
led_vers	Read Only	Version of LED CPLD. For example v0x04

Table 7-5: Key Value Database

Key Name	Type	Description
s0_act_bank	Read Only	This key was deprecated in release PP50 V1.2 Update 1. It was replaced with the two new keys sX_cur_bank (X: 0 or 1) and sX_next_bank (X: 0 or 1). It displays the active bank id (0 or 1) for payload 0 (XLR0).
s1_act_bank	Read Only	This key was deprecated in release PP50 V1.2 Update 1. It was replaced with two the new keys sX_cur_bank (X: 0 or 1) and sX_next_bank (X: 0 or 1). It displays the active bank id (0 or 1) for payload 1 (XLR1).
sX_cur_bank (X: 0 or 1)	Read Only	Current payload boot flash bank being used, value is 0 or 1.
sX_next_bank (X: 0 or 1)	Read/Write	Payload boot flash bank to be used next (after payload is rebooted), value is 0 or 1.
fswitchCfg	Read / Write	This key lists the path for fswitch configuration file. This key is to be set by user. Default value of this key is "/etc/fswitchCfg.def"
cnbsa_proto	Read / Write	Protocol for eth0 interface (Base channel A) on CNode. Possible values are: "static" or "dhcp".
ipaddr	Read / Write	IP address assigned to eth0 interface (Base channel A) of CNode.
netmask	Read / Write	Netmask for eth0 interface (Base channel A) of CNode.
cnbsb_proto	Read / Write	Protocol for eth0.4094 interface (Base channel B) on CNode. Possible values are: "static" or "dhcp".
netmask_b	Read / Write	Netmask for eth0.4094 interface (Base channel B) of CNode.
ipaddr_b	Read / Write	IP address assigned to eth0.4094 interface (Base channel B) of CNode.
serverip	Read / Write	Server IP address
gatewayip	Read / Write	Gateway IP address
dnsdomain	Read / Write	Flag indicating whether DNS configuration is enabled or disabled. This flag should be set only when interface protocol is set to "static". Possible values are: "enable" or "disable".

Table 7-5: Key Value Database

Key Name	Type	Description
dns_ns1	Read / Write	IP address of DNS server 1. This is used only when interface protocol is set to "static" and the key dnsdomain is set to "enable".
dns_ns2	Read / Write	IP address of DNS server 2. This is used only when interface protocol is set to "static" and the key dnsdomain is set to "enable".
sysid	Read / Write	This is an optional key and can be useful in multi-shelf system. This key is used in building dhcp client identifier for CNode's DHCP discover message. Client id has the format of [$sysid]-[$shelfid]-$hwaddr-cn-bsa for eth0 interface and [$sysid]-[$shelfid]-$hwaddr-cn-bsb for eth0.4094 interface. This key can be assigned any integer value.
shelfid	Read / Write	This is an optional key and can be useful in multi-shelf system. This key is used in building dhcp client identifier for CNode's DHCP discover message. Client id has the format of [$sysid]-[$shelfid]-$hwaddr-cn-bsa for eth0 interface and [$sysid]-[$shelfid]-$hwaddr-cn-bsb for eth0.4094 interface. This key can be assigned any integer value.
ntpserver	Read / Write	Address of NTP server. If this key is set then ntpclient on CNode adjusts time using the specified server. CCPU has reserved following ntp servers and user can set this key to point to any of these server addresses: "0.ccpu.pool.ntp.org", "1.ccpu.pool.ntp.org", "2.ccpu.pool.ntp.org", "3.ccpu.pool.ntp.org".
sel_overwrite	Read / Write	This is an optional key to enable SEL overwriting. Possible values are: 0 or 1. CNode has a 4K bytes of EEPROM for on-board SEL (System Event Logging). IPMC module only writes critical events in SEL, though all the events are sent to Shelf Manager (if enabled). By default (if this key is not configured, Or if this key is configured and set to 0), IPMC would not overwrite SEL EEPROM once it is full and rather would rely on Shelf Manager (and/or System Management application) to clear on-board SEL. If this key is set to 1, then IPMC shall rotate SEL logs (as a circular buffer) once it is full.

Table 7-5: Key Value Database

Key Name	Type	Description
auto_compat	Read / Write	This is an optional key and is needed to fix the compatibility issue of a non-front board managed FRU (example: RTM) with front board fru. Each non-front board managed fru is assigned a compatibility key (fru_compat) which is programmed into its manufacturing database. During board activation, CNode ipmc matches non-front board fru's compatibility key with corresponding key in front board fru's manufacturing database and it activates this non-front board fru only when those two keys are matching, otherwise it prints an error of compatibility mismatch and leaves that non-front board fru in M0 state. Compatibility matching can also fail when non-front board fru's manufacturing database is empty and/or it does not contain fru_compat key. Possible values of this auto_compat key are: 0: Auto compatibility is turned OFF. This is same as auto_compat key not configured. In this case, CNode IPMC shall activate non-front board fru only when compatibility test passes. 1: Auto compatibility is turned ON forever. In this case, CNode IPMC overwrites and corrects fru_compat key in non-front board fru's manufacturing database and also in front board fru's manufacturing database, if required. With this value of auto_compat key, CNode IPMC does this auto correction each time before a non-front board fru is activated. 2: Auto compatibility is turned ON for once and then it is turned OFF. CNode IPMC shall correct compatibility keys for once and then it will turn off auto compatibility feature.

Table 7-5: Key Value Database

Key Name	Type	Description
		Note: Note: Compatibility matching of a non-front board fru (e.g. RTM) with front board fru is required and necessary to protect hardware from getting damaged. So auto compatibility should be used carefully and only in scenarios where non-front board fru's manufacturing database does not have fru_compat key in it. Auto compatibility feature should never be enabled to match and fix compatibility in all other genuine scenarios where non-front board is not matching with front board fru because of different values of their compatibility keys. **Note:** If the RTM manufacturer’s fru data has a kv brd_compat key, the auto_compat configuration will have no affect on the RTM fru_compat value.
cnnumofveths	Read/Write	Virtual emac function, see Section 8.3.2, "Configurable Behavior" for details. If cnnumofveths is non-existent or set to zero, the driver will initialize the num_of_fakes variable to 0 and default behavior is preserved.
xlrfru	Read/Write	This is an optional key and is needed to create one managed FRU for each of the XLRs. By default IPMC does not create a managed FRUs for XLRs and rather each of the XLRs are payloads of the front board FRU only. Possible values of this key are: 0: no managed FRU for XLR and the feature is disabled; same as not having the key at all. 1: create one managed FRU for each XLR.
_s0_fruid	Read Only	This key identifies the FRU to which payload 0 (XLR0) belongs to.”
_s1_fruid	Read Only	This key identifies the FRU to which payload 1 (XLR1) belongs to.”

Table 7-5: Key Value Database

Key Name	Type	Description
_s0_fwprogid	Read Only	This key identifies the Firmware Progress Sensor for the payload 0 (XLR0). Payload requires the sensor id to send events and status to IPMC using “Set Sensor Reading and Event Status” command on its Firmware Progress Sensor.
_s1_fwprogid	Read Only	This key identifies the Firmware Progress Sensor for the payload 1 (XLR1). Payload requires the sensor id to send events and status to IPMC using “Set Sensor Reading and Event Status” command on its Firmware Progress Sensor.
s[0|1]_multiboot	Read/Write	See Section 6.2.1.9, "Initializing Multiboot" for details.
s[0|1]_bootdelay	Read/Write	See Section 6.2.1.9.3, "Setting the s[0_1]_multiboot Key Value" for details.
cn_wd_report	Read Only	Watchdog report key. For internal use only.

7.4.2 To List All Key Value Entries

Usage: cnodekv

Typical Output (your output may be different):

```
root@cnode-pp50:~ cnodekv
ipmc_version = pp50-ipmc-v2.4.0r00
datetime = 2009-02-21 00:40:14
epochtime = 1235176814
xlr0base = 00:02:bb:50:02:00
xlr1base = 00:02:bb:50:02:08
hwaddr = 45
f1_presence = 1
f2_presence = 1
__pwr_regs = ff00000000000000
__f0_poh = 713
__s0_rstcause = pwrcycle
__s0_rsttime = 2009-02-20 23:16:40
__s1_rstcause = pwrcycle
__s1_rsttime = 2009-02-20 23:16:40
__cn_rstcause = cold_reset
__cn_rsttime = 2009-02-12 19:02:36
fswitchCfg = /etc/fswitchCfg.def
route10g = faceplate
ethaddr = 00:02:bb:50:02:06
ntpserver = 0.ccpu.pool.ntp.org
sel_overwrite = 0
s0_act_bank = 0
s1_act_bank = 0
```

```
s0_vers2 = v0x08
s1_vers2 = v0x08
led_vers = v0x04
cnbsb_proto = dhcp
ipmc_vers1 = pp50-ipmc-v2.3.3b06
ipmc_act_bank = 0
ipmc_vers0 = pp50-ipmc-v2.4.0r00
cnbsa_proto = dhcp
```

7.5 IPMI and PICMG Commands

This section lists all those commands which are currently supported on PP50.

7.5.1 IPMI Device Global Commands

Table 7-6: IPMI Device Global Commands

Command	NetFn	CMD
Get Device Id	App (06h)	01h
Broadcast “Get Device ID”	App (06h)	01h
Cold Reset	App (06h)	02h

Note: In the handling of IPMI Cold Reset all the devices on the board are reset.

7.5.2 BMC Watchdog Timer Commands

Table 7-7: BMC Watchdog Timer Commands

Command	NetFn	CMD
Reset Watchdog Timer	App (06h)	22h
Set Watchdog Timer	App (06h)	24h
Get Watchdog Timer	App (06h)	25h

7.5.3 Chassis Device Commands

Table 7-8: Chassis Device Commands

Command	NetFn	CMD
Get POH Counter	Chassis (00h)	0Fh

7.5.4 Event Commands

Table 7-9: Event Commands

Command	NetFn	CMD
Set Event Receiver	S/E (04h)	00h
Get Event Receiver	S/E (04h)	01h
Platform Event (a.k.a. “Event Message”)	S/E (04h)	02h

Note: The Set Event Receiver command is only honored to change event receiver address, if this command is received on an IPMB channel. However, Get Event Receiver command is honored even from non-ipmb channels and returns correct address of event receiver.

7.5.5 Sensor Device Commands

Table 7-10: Sensor Device Commands

Command	NetFn	CMD
Get Device SDR Info	S/E (04h)	20h
Get Device SDR	S/E (04h)	21h
Reserve Device SDR Repository	S/E (04h)	22h
Get Sensor Reading Factor	S/E (04h)	23h
Set Sensor Hysteresis	S/E (04h)	24h
Get Sensor Hysteresis	S/E (04h)	25h
Set Sensor Threshold	S/E (04h)	26h
Get Sensor Threshold	S/E (04h)	27h
Set Sensor Event Enable	S/E (04h)	28h
Get Sensor Event Enable	S/E (04h)	29h
Re-arm Sensor Events	S/E (04h)	2Ah
Get Sensor Event Status	S/E (04h)	2Bh
Get Sensor Reading	S/E (04h)	2Dh
Set Sensor Reading And Event Status*	S/E (04h)	30h

* This command is only supported for these two Firmware Progress Sensors: XLR0 FW Progress and XLR1 FW Progress. Customer application can use sensor reading value in the range 0x80 - 0xFF in Set Sensor Reading command to FW Progress Sensors.

7.5.6 FRU Device Commands

Table 7-11: FRU Device Commands

Command	NetFn	CMD
Get FRU Inventory Area Info	Storage (0Ah)	10h
Read FRU Data	Storage (0Ah)	11
Write FRU Data	Storage (0Ah)	12

7.5.7 SDR Device Commands

Table 7-12: SDR Device Commands

Command	NetFn	CMD
Get SDR Repository Info	Storage (0Ah)	20h
Reserve SDR Repository	Storage (0Ah)	22h
Get SDR	Storage (0Ah)	23h
Exit SDR Repository Update Mode	Storage (0Ah)	2Bh

7.5.8 SEL Device Commands

Table 7-13: SEL Device Commands

Command	NetFn	CMD
Get SEL Info	Storage (0Ah)	40h
Get SEL Entry	Storage (0Ah)	43h
Add SEL Entry	Storage (0Ah)	44h
Clear SEL	Storage (0Ah)	47h
Get SEL Time	Storage (0Ah)	48h
Set SEL Time	Storage (0Ah)	49h

The CNode has 4K bytes of EEPROM for System Event Logging (SEL). IPMC module only writes critical events in SEL, though all the events are sent to Shelf Manager (if enabled). Currently IPMC logs only these types of events into onboard SEL:

- When upper non-recoverable threshold is crossed for a threshold based sensor.
- Expiration of the BMC watchdog timer, provided don't log flag is not set in the previous "Set Watchdog Timer" command.

By default, IPMC modules does not overwrite SEL EEPROM once it is full and rather it relies on Shelf Manager (and/or System Management application) to clear on-board SEL. However, optionally, IPMC module does provide a mechanism to rotate SEL logs, if desired. Key-Value database entry "sel_overwrite" requires to be set to 1 to enable this optional SEL overwrite feature. Default value of this key "sel_overwrite" is set to 0.

7.5.9 ATCA (PICMG 3.0) Commands

Please refer to the list below for ATCA commands.

Table 7-14: AdvancedTCA Commands

Command	NetFn	CMD
Get PICMG Properties	PICMG (2Ch)	00h
Get Address Info	PICMG (2Ch)	01h
FRU Control, see Section 7.5.9.1, "FRU Control Command" for details.	PICMG (2Ch)	04h
Get FRU LED Properties	PICMG (2Ch)	05h
Get LED Color Capabilities	PICMG (2Ch)	06h
Set FRU LED State	PICMG (2Ch)	07h
Get FRU LED State	PICMG (2Ch)	08h
Set IPMB State	PICMG (2Ch)	09h
Set FRU Activation Policy	PICMG (2Ch)	0Ah
Get FRU Activation Policy	PICMG (2Ch)	0Bh
Set FRU Activation	PICMG (2Ch)	0Ch
Get Device Locator Record ID	PICMG (2Ch)	0Dh
Set Port State	PICMG (2Ch)	0Eh
Get Port State	PICMG (2Ch)	0Fh
Computer Power Properties	PICMG (2Ch)	10h
Set Power Level	PICMG (2Ch)	11h
Get Power Level	PICMG (2Ch)	12h
FRU Control Capabilities	PICMG (2Ch)	1Eh

Note: Set FRU LED State command for the Lamp Test function is not supported for individual LEDs. Therefore, to use the Lamp Test function, you need to issue the Set FRU LED State command to address all the LEDs at once by filling the LED ID byte as 0xff.

7.5.9.1 FRU Control Command

The "FRU Control" command provides base level control over the FRU's Payload. Through this command, the Payload can be reset, rebooted, or have its diagnostics initiated. PICMG defines following four options for this command –

- Cold Reset – This is a mandatory option. This option causes a hardware reset of the payload, similar to a power on reset. No graceful shutdown of payload OS occurs prior to this reset so user should issue this command keeping on mind the impact of this reset.
- Warm Reset – This is an optional option and is not supported as of now.
- Graceful Reboot – This causes graceful shutdown and reboot of payload OS. Please see Section 7.5.9.1.1, "Configuration for Graceful Reboot of Payload" for further details.
- Issue Diagnostic Interrupt – This is an optional option and is not supported as of now.

Since some parts of the "FRU Control" command are optional, the "FRU Control Capabilities" command provides a way to query which specific options a FRU supports in the "FRU Control" command.

7.5.9.1.1 Configuration for Graceful Reboot of Payload

At present, graceful shutdown/reboot is only supported on Wind River Linux 2.0 BSP. A daemon named ipmcd (referred to as IPMCD_P) is on each payload (XLR) to handle these requests from the IPMC. When IPMCD_P receives the hotswap events for deactivation or graceful reboot from IPMC it executes the graceful shutdown or graceful reboot.

Configuration File

IPMCD_P uses the IPMI watchdog command for graceful reboot timeout operation and provides an interface to call customer scripts. The configuration file:

/etc/ipmcd/ipmcd.conf

uses IPMCD_P to configure the timeout and script location as follows.

- "REBOOT_TIMEOUT" is timeout seconds for graceful reboot, the default is 120 seconds.

- “SCRIPT_PATH” is the path and name of the customer script. The script must only return “0” or “1”. The “0” indicates the payload can support graceful reboot now and will set a watchdog timer to the IPMC before it executes the reboot. The “1” indicates the payload cannot support graceful reboot in its present state. The default script is /etc/ipmcd/prepare_boot and just returns 0.

7.5.10 OEM API Commands

This section describes all the OEM commands supported by PP50. These OEM commands can be issued either in IPMI message format or in SIPL message format (from Payload).

In IPMI message format, NetFn Request code byte for all these OEM commands is 0x2e and the Response code byte is 0x2f.

In SIPL message format, NetFn Request code byte is 0xB8 and Response code byte is 0xB9. Please see example of OEM IPMI command syntax at the end of Section 7.5.10.1, "Get Payload CPU-Reset".

Table 7-15: OEM Request and Response CodeBytes

	NetFn Request	Response
IPMI	0x2e	0x2f
SIPL	0xB8	0xB9

For each of the OEM commands request data and response data format is listed below.

7.5.10.1 Get Payload CPU-Reset

Command: 50h

Sub-command: 0Ch.

Table 7-16: Get Payload CPU-Reset Request Data

Byte	Value	Description
1st byte	3Ah	IANA low byte
2nd byte	1Fh	IANA mid byte

Table 7-16: Get Payload CPU-Reset Request Data

Byte	Value	Description
3rd byte	00h	IANA high byte
4th byte	0Ch	Continuous Computing OEM subcommand code
5th byte	--	00h Payload CPU #1 (XLR0) 01h Payload CPU #2 (XLR1)

Table 7-17: Get Payload CPU-Reset Response Data

Byte	Value	Description
1st byte	00h	Completion code
2nd byte	3Ah	IANA low byte
3rd byte	1Fh	IANA mid byte
4th byte	00h	IANA high byte
5th byte	0Ch	Continuous Computing OEM subcommand code
6th byte	--	00h Deasserted 01h Asserted

Example using Pigeon Point ShMC:

Pigeon Point ShMc CLI allows sending arbitrary IPMI command using the command sendcmd. Using this command, PP50 can be queried to get the payload CPU-Reset status of XLR0

```
CLI> sendcmd 0x86 0x2e 0x50 0x3a 0x1f 0x00 0x0c 0x00
Completion code: 0x0 (0)
Response data: 3A 1F 00 0C 00
```

Example using ipmitool:

Ipmitool is a freeware which can be used to send arbitrary IPMI command from a host server.

```
$ ipmitool -I lan -H 172.17.50.100 -t 0x86 -L user -P “” raw 0x2e 0x50 0x3a 0x1f
0x00 0x0c 0x00 3a 1f 00 0c 00
```

Where 172.17.50.100 is the IP address of the Shelf Manager which bridges ipmitool’s RMCP message to IPMB message towards PP50 blade at IPMB address 0x86.

7.5.10.2 Set Payload CPU-Reset

Command: 50h

Sub-command: 0Dh.

Table 7-18: Set Payload CPU-Reset Request Data.

Byte	Value	Description
1st byte	3Ah	IANA low byte
2nd byte	1Fh	IANA mid byte
3rd byte	00h	IANA high byte
4th byte	0Dh	Continuous Computing OEM subcommand code
5th byte	--	00h Payload CPU #1 (XLR0) 01h Payload CPU #2 (XLR1)
6th byte	--	00h Deasserted 01h Asserted 02h Pulse (assert, then deassert)

Table 7-19: Set Payload CPU-Reset Response Data

Byte	Value	Description
1st byte	00h	Completion code
2nd byte	3Ah	IANA low byte
3rd byte	1Fh	IANA mid byte
4th byte	00h	IANA high byte
5th byte	0Dh	Continuous Computing OEM subcommand code

7.5.10.3 Get Payload Active Flash Bank

Command: 50h

Sub-command: 0Eh.

Table 7-20: Get Payload Active Flash Bank Request Data

Byte	Value	Description
1st byte	3Ah	IANA low byte
2nd byte	1Fh	IANA mid byte
3rd byte	00h	IANA high byte
4th byte	0Eh	Continuous Computing OEM subcommand code
5th byte	--	00h Payload CPU #1 *XLR0) 01h Payload CPU #2 (XLR1)

Figure 7-1: Get Payload Active Flash Bank Response Data

Byte	Value	Description
1st byte	00h	Completion code
2nd byte	3Ah	IANA low byte
3rd byte	1Fh	IANA mid byte
4th byte	00h	IANA high byte
5th byte	0Eh	Continuous Computing OEM subcommand code
6th byte	--	00h Payload CPU #1 (XLR0) 01h Payload CPU #2 (XLR1)
7th byte	--	00h Bank 0 01h Bank 1

7.5.10.4 Set Payload Active Flash Bank

Command: 50h

Sub-command: 0Fh.

To ensure that the flash memory isn't corrupted, the Set Payload Active Flash Bank command will cause the IPMC to always assert CPU reset state (if it's not already asserted), switch the flash bank, and then de-assert CPU reset.

Figure 7-2: Set Payload Active Flash Bank Request Data

Byte	Value	Description
1st byte	3Ah	IANA low byte
2nd byte	1Fh	IANA mid byte
3rd byte	00h	IANA high byte
4th byte	0Fh	Continuous Computing OEM subcommand code
5th byte	--	00h Payload CPU #1 (XLR0) 01h Payload CPU #2 (XLR1)
6th byte	--	00h Bank 0 01h Bank 1

Figure 7-3: Set Payload Active Flash Bank Response Data

Byte	Value	Description
1st byte	00h	Completion code
2nd byte	3Ah	IANA low byte
3rd byte	1Fh	IANA mid byte
4th byte	00h	IANA high byte
5th byte	0Fh	Continuous Computing OEM subcommand code

7.5.10.5 Get Self Payload ID

This command may be used by payload to find out its payload ID. This command cannot be sent on a non-payload channel and will generate error on non-payload channel.

Command: 50h

Sub-command: 20h

Table 7-21: Get Self Payload ID Request Data

Byte	Value	Description
1st byte	0x3a	IANA low byte
2nd byte	0x1f	IANA mid byte
3rd byte	0x00	IANA high byte
4th byte	0x20	Continuous Computing OEM subcommand code

Table 7-22: Get Self Payload ID Response Data

Byte	Value	Description
1st byte	--	Completion code • 0x00: Success • 0xC1: Invalid command on non-payload channel • 0xC7: Invalid data len • 0zCB: No sensor for this payload
2nd byte	0x3a	IANA low byte
3rd byte	0x1f	IANA mid byte
4th byte	0x00	IANA high byte
5th byte	0x20	Continuous Computing OEM subcommand code
5th byte	--	Payload id: 0 for XLR0 1 for XLR1

7.5.10.6 Get Payload ID for Watchdog Commands

Issue this command on non-payload channels. Per IPMI specification, the BMC watchdog timer commands can be issued from the management interface (non-payload channel) and this OEM command can be used prior to using the watchdog commands to determine the current value of the payload ID.

All the subsequent watchdog timer commands on non-pay channels will be acted on the payload identified by the ID returned by this command. On system startup the default value of this payload ID is 0. The syntax of this command is given in the table below.

Command: 50h

Sub-command: 21h

Table 7-23: Get Payload ID for Watchdog Commands Request Data

Byte	Value	Description
1st byte	0x3a	IANA low byte
2nd byte	0x1f	IANA mid byte
3rd byte	0x00	IANA high byte
4th byte	0x21	Continuous Computing OEM subcommand code

Table 7-24: Get Payload ID for Watchdog Commands Response Data

Byte	Value	Description
1st byte	--	Completion code: • 0x00: Success • 0xC7: Invalid data len • 0xCB: No payload sensors found
2nd byte	0x3a	IANA low byte
3rd byte	0x1f	IANA mid byte
4th byte	0x00	IANA high byte
5th byte	0x21	Continuous Computing OEM subcommand code
5th byte	--	Payload id: 0 for XLR0 1 for XLR1

7.5.10.7 Set Payload ID for Watchdog Commands

Issue this command on non-payload channels to set the payload ID for subsequent watchdog commands from the non-payload channels. The syntax of this command is given in the table below.

Command: 50h

Sub-Command: 22h

Table 7-25: Set Payload ID for Watchdog Commands Request Data

Byte	Value	Description
1st byte	0x3a	IANA low byte
2nd byte	0x1f	IANA mid byte
3rd byte	0x00	IANA high byte
4th byte	0x22	Continuous Computing OEM subcommand code
5th byte	--	Payload id: 0 for XLR0 1 for XLR1

Table 7-26: Set Payload ID for Watchdog Commands Response Data

Byte	Value	Description
1st byte	--	Completion code: • 0x00: Success • 0xC7: Invalid data len • 0xCB: No payload sensors found • 0xCC: Invalid payload id, no sensor for this payload id
2nd byte	0x3a	IANA low byte
3rd byte	0x1f	IANA mid byte
4th byte	0x00	IANA high byte
5th byte	0x22	Continuous Computing OEM subcommand code

7.5.10.8 Get IPMC Key N

Command: 50h

Sub-command: 10h.

Table 7-27: Get IPMC Key N Request Data

Byte	Value	Description
1st byte	3Ah	IANA low-byte
2nd byte	1Fh	IANA mid-byte
3rd byte	00h	IANA high-byte
4th byte	10h	Continuous Computing OEM Subcommand Code
5th byte	-	index of "key" to retrieve

Table 7-28: Get IPMC Key N Response Data

Byte	Value	Description
1st byte	--	Completion Code: • 0x00: Success. • 0xC7: Total number of data bytes is incorrect.
2nd byte	3Ah	IANA low-byte
3rd byte	1Fh	IANA mid-byte
4th byte	00h	IANA high-byte
5th byte	10h	Continuous Computing OEM Subcommand Code
6th byte	n	length of the "key" 0 = invalid key index was specified in the request 1 to 14 = number of bytes of "value" that follow
[7:6+n]	-	"key" bytes, 1 to 14 bytes

7.5.10.9 Get IPMC Key-Value

Command: 50h

Sub-command: 11h.

Table 7-29: Get IPMC Key-Value Request Data

Byte	Value	Description
1st byte	3Ah	IANA low-byte
2nd byte	1Fh	IANA mid-byte
3rd byte	00h	IANA high-byte
4th byte	11h	Continuous Computing OEM Subcommand Code
5th byte	m	1 to 14 = number of bytes of “key” that follow
6th byte	n	1 to 16 = number of bytes of “value” to retrieve
7th byte	o	0 to 31 = offset of “value” to retrieve
[8:7+m]	-	“key” bytes, 1 to 14 bytes long

Table 7-30: Get IPMC Key-Value Response Data

Byte	Value	Description
1st byte	--	Completion Code: • 0x00: Success. • 0xC7: Total number of data bytes is incorrect. • 0xC9: Either key size is incorrect, key-value len is incorrect, or key value offset is incorrect.
2nd byte	3Ah	IANA low-byte
3rd byte	1Fh	IANA mid-byte
4th byte	00h	IANA high-byte
5th byte	11h	Continuous Computing OEM Subcommand Code
6th byte	m	1 to 32 = total size of the “value”
7th byte	o	0 = invalid “key” or offset was specified in the request 1 to 16 = number of bytes of “value” that follow
[8:7+n]	-	“value” bytes, 1 to 16 bytes

7.5.10.10 Set IPMC Key-Value

Command: 50h

Sub-command: 12h.

Table 7-31: Set IPMC Key-Value Request Data

Byte	Value	Description
1st byte	3Ah	IANA low-byte
2nd byte	1Fh	IANA mid-byte
3rd byte	00h	IANA high-byte
4th byte	12h	Continuous Computing OEM Subcommand Code
5th byte	m	1 to 14 = number of bytes of “key”
6th byte	n	number of “value” bytes that follow 0 = delete the key/value entry 1 to 8 = number of “value” bytes
7th byte	-	total size of the “value” 0 = delete the key/value entry 1 to 32 = total length of the “value”
8th byte	-	0 to 31 = offset of the “value” to set
[9:8+m]	-	“key” bytes, where m = 1 to 14
[9+m:8+m+n]	-	“value” bytes, where n = 1 to 8

Table 7-32: Set IPMC Key-Value Response Data

Byte	Value	Description
1st byte	--	Completion Code: • 0x00: Success. • 0xC7: Total number of data bytes is incorrect. • 0xC9: either key size is incorrect, Or key-value len is incorrect, Or total value len of key is incorrect, Or key value offset is incorrect. • 0xCC: Request to delete / update an RO kv key, i.e. data field "key" is invalid. • 0xFF: Deletion of a key failed because of error in writing eeprom or some other internal error. • 0xCB: Deletion request of a key which does not exist. • 0xC4: key update/create is failed because of failure in eeprom write and/or eeprom space.
2nd byte	3Ah	IANA low-byte
3rd byte	1Fh	IANA mid-byte
4th byte	00h	IANA high-byte
5th byte	12h	Continuous Computing OEM Subcommand Code

Notes:

1. The key/value variables are persistent across firmware updates
2. If the length of the "value" is 0, then the key/value entry is removed
3. When sending this OEM command on an IPMB channel, make sure that total number of data bytes is 25 or less so as to fit into one IPMI message. IPMI message size on an IPMB channel is 32 bytes which includes 7 bytes of IPMI message header.

7.5.10.11 Get IPMC Key-Value Extended

This is an extended version of “Get IPMC Key-Value” command. This command is only applicable on a non-IPMB channel (for example, payload channel or Direct RMCP to CNode). This command allows user to request complete key value length of 32 bytes in one single Get Key value request message.

Command: 50h

Sub-command: 13h .

Table 7-33: Get IPMC Key-Value Extended Request Data

Byte	Value	Description
1st byte	3Ah	IANA low-byte
2nd byte	1Fh	IANA mid-byte
3rd byte	00h	IANA high-byte
4th byte	13h	Continuous Computing OEM Sub-command Code
5th byte	m	1 to 14 = number of bytes of “key” that follow
6th byte	n	1 to 32 = number of bytes of “value” to retrieve
7th byte	o	0 to 31 = offset of “value” to retrieve
[8:7+m]	-	“key” bytes, 1 to 14 bytes long

Table 7-34: Get IPMC Key-Value Extended Response Data

Byte	Value	Description
1st byte	--	Completion code: • 0xC7: Total number of data bytes is incorrect.0x00: Success • 0xC1: Request on IPMB channel. This command is only applicable on non-IPMB channel • 0xC7: Total number of data bytes in incorrect • 0xC9: Either key size if incorrect, key-value len is incorrect, or key value offset is incorrect.
2nd byte	3Ah	IANA low-byte
3rd byte	1Fh	IANA mid-byte

Table 7-34: Get IPMC Key-Value Extended Response Data

4th byte	00h	IANA high-byte
5th byte	13h	Continuous Computing OEM Sub-command Code
6th byte	m	1 to 32 = total size of the “value”
7th byte	o	0 = invalid “key” or offset was specified in the request 1 to 32 = number of bytes of “value” that follow
[8:7+n]	-	“value” bytes, 1 to 32 bytes

7.5.10.12 Set IPMC Key-Value Extended

This is an extended version of “Set IPMC Key-Value” command. This command is only applicable on a non-IPMB channel (for example, payload channel or Direct RMCP to CNode). This command allows user to set complete key value length of 32 bytes in one single Set Key value request message.

Command: 50h

Sub-command: 14h.

Table 7-35: Set IPMC Key-Value Extended Request Data

Byte	Value	Description
1st byte	3Ah	IANA low-byte
2nd byte	1Fh	IANA mid-byte
3rd byte	00h	IANA high-byte
4th byte	14h	Continuous Computing OEM Sub-command Code
5th byte	m	1 to 14 = number of bytes of “key” that follow
6th byte	n	Number of “value” bytes that follow 0 = delete the key/value entry 1 to 32 = number of “value” bytes
7th byte	-	Total size of the “value” 0 = delete the key/value entry 1 to 32 = total length of the “value”
8th byte	-	0 to 31 = offset of the “value” to set
[9:8+m]	-	“key” bytes, where m = 1 to 14
[9+m:8+m+n]	-	“value” bytes, where n = 1 to 32

Table 7-36: Set IPMC Key-Value Extended Response Data

Byte	Value	Description
1st byte	--	Completion code • 0x00: Success • 0xC1: Request on IPMB channel. This command is only applicable on non-IPMB channel • 0xC7: Total number of data bytes in incorrect • 0xC9: Either key size if incorrect, Or key-value len is incorrect, Or total value len of key is incorrect, Or key value offset is incorrect. • 0xCC: Request to delete / update an Read-Only KV key, i.e. data field "key" is invalid • 0xFF: Deletion of a key failed because of error in writing eeprom or some other internal error. • 0xCB: Deletion request of a key which does not exist • 0xC4: Key value update/create failed because of failure in eeprom write and/or eeprom not having enough space.
2nd byte	3Ah	IANA low-byte
3rd byte	1Fh	IANA mid-byte
4th byte	00h	IANA high-byte
5th byte	14h	Continuous Computing OEM Sub-command Code

7.5.10.13 Sensor Thresholds and Hysteresis Overview

The IPMC file system has a read-only data set with each release. It contains the factory defaults for all the sensor thresholds and hysteresis values. These defaults are the least restrictive practical values to allow the board the maximum chance of operating.

In addition to the factory default data, the IPMC file system has a writable persistence file (/etc/defThreshHyst.dat) where the user can commit current working thresholds and hysteresis values. At boot time, the IPMC reads thresholds and hysteresis values from the committed default files and initializes those sensors. If this file does not exist at boot time, then the IPMC uses the factory default values for sensor initialization and it copies those factory default values into the committed default file (/etc/defThreshHyst.dat).

Any change in sensor thresholds and hysteresis by using IPMI sensor commands (Set Sensor Thresholds and Set Sensor Hysteresis) only changes the working values (in RAM) of thresholds and hysteresis and not the persistence file (/etc/defThreshHyst.dat). Similarly any change in the persistence committed default file (/etc/defThreshHyst.dat) file does not come into effect until the next IPMC restart.

The committed default file is stored in the active flash bank only so after an IPMC upgrade, the customer is responsible for installing their desired committed defaults on the upgraded flash bank (if they do not want to use the factory defaults).

This section describes OEM commands that manage sensor thresholds and hysteresis in memory and in the committed default file (/etc/defThreshHyst.dat).

7.5.10.13.1 Restore Factory Default Thresholds and Hysteresis

This command copies read-only factory default values of sensor thresholds and hysteresis into committed default file (/etc/defThreshHyst.dat).

Table 7-37: Command: 50h Sub-command: 23h Request data

Byte	Value	Description
1st byte	3Ah	IANA low-byte
2nd byte	1Fh	IANA mid-byte
3rd byte	00h	IANA high-byte
4th byte	23h	CCPU OEM Subcommand Code

Table 7-38: Command: 50h Sub-command: 23h Response data

Byte	Value	Description
1st byte	-	Completion code: • 00h: Success • FFh: Error in file open or file write
2nd byte	3Ah	IANA low-byte
3rd byte	1Fh	IANA mid-byte
4th byte	00h	IANA high-byte
5th byte	23h	CCPU OEM Subcommand Code

7.5.10.13.2 Commit Working Thresholds and Hysteresis to Default

This command writes current working values of thresholds and hysteresis into committed default file (/etc/defThreshHyst.dat) so that on next restart of IPMC, sensors are initialized with those values.

Table 7-39: Command: 50h Sub-command: 24h Request data

Byte	Value	Description
1	3Ah	IANA low-byte
2	1Fh	IANA mid-byte
3	00h	IANA high-byte
4	24h	CCPU OEM Subcommand Code

Table 7-40: Command: 50h Sub-command: 24h Response data

Byte	Value	Description
1	-	Completion code • 00h: Success • FFh: Error in file open or file write
2	3Ah	IANA low-byte
3	1Fh	IANA mid-byte
4	00h	IANA high-byte
5	24h	CCPU OEM Subcommand Code

7.5.10.13.3 Read Committed Default Thresholds and Hysteresis into Working

This command reads thresholds and hysteresis from committed default file (/etc/defThreshHyst.dat) into working copy in RAM.

Table 7-41: Command: 50h Sub-command: 25h Request data

Byte	Value	Description
1	3Ah	IANA low-byte
2	1Fh	IANA mid-byte
3	00h	IANA high-byte
4	25h	CCPU OEM Subcommand Code

Table 7-42: Command: 50h Sub-command: 25h Response data

Byte	Value	Description
1	-	Completion code 00h: Success FFh: Error in file open or file read
2	3Ah	IANA low-byte
3	1Fh	IANA mid-byte
4	00h	IANA high-byte
5	25h	CCPU OEM Subcommand Code

7.5.11 IPMI Command Completion Codes

The IPMI specification version 1.5 defines the IPMI message0xC0 completion codes. Those currently returned by the OEM messages are shown in the following table.

Table 7-1: IPMI Command Completion Codes

Code	OEM	Description
0x00	Y	Command Completed Normally.
0x80	N	This is a command-specific completion code. • For BMC Watchdog Timer Commands, the completion code 0x80 means attempt to start un-initialized watchdog by issuing Reset Watchdog Timer command. That means a Set Watchdog Timer command has not yet been issued to initialize the timer since the last system power on, reset, or BMC reset. • For Sensor Device Commands, the completion code of 0x80 means attempt to change reading or set or clear status bits that are not settable via Set Sensor Reading and Event Status command.
0x81	N	This is a command-specific completion code applicable for Sensor Device Commands. This completion code means attempt to set event data bytes for a sensor for which setting Event Data Bytes is not supported.
0xc0	Y	Node Busy. Command could not be processed because command processing resources are temporarily unavailable

Table 7-1: IPMI Command Completion Codes

Code	OEM	Description
0xc1	Y	Invalid Command. Used to indicate an unrecognized or unsupported command.
0xc2	N	Command invalid for given LUN.
0xc3	N	Timeout while processing command. Response unavailable.
0xc4	N	Out of space. Command could not be completed because of a lack of storage space required to execute the given command operation.
0xc5	N	Reservation Canceled or Invalid Reservation ID.
0xc6	N	Request data truncated
0xc7	N	Request data length invalid
0xc8	N	Request data field length limit exceeded.
0xc9	N	Parameter out of range. One or more parameters in the data field of the Request are out of range. This is different from 'Invalid data field' (0xcc) code in that it indicates that the erroneous field(s) has a contiguous range of possible values.
0xca	N	Cannot return number of requested data bytes.
0xcb	N	Requested Sensor, data, or record not present.
0xcc	N	Invalid data field in Request
0xcd	N	Command illegal for specified sensor or record type.
0xce	N	Command response could not be provided.
0xcf	N	Cannot execute duplicated request. This completion code is for devices which cannot return the response that was returned for the original instance of the request. Such devices should provide separate commands that allow the completion status of the original request to be determined. An Event Receiver does not use this completion code, but returns the 00h completion code in the response to (valid) duplicated requests.
0xd0	N	Command response could not be provided. SDR Repository in update mode.
0xd1	N	Command response could not be provided. Device in firmware update mode.

Table 7-1: IPMI Command Completion Codes

Code	OEM	Description
0xd2	N	Command response could not be provided. BMC initialization or initialization agent in progress.
0xd3	N	Destination unavailable. Cannot deliver request to selected destination. E.g. this code can be returned if a request message is targeted to SMS, but receive message queue reception is disabled for the particular channel.
0xd4	N	Cannot execute command. Insufficient privilege level.
0xd5	N	Command not supported in current state.
0xff	Y	Unspecified error

7.6 Error Logging

IPMC modules (and also some other daemons running on CNode) logs critical information and errors in /var/log/messages. This file is also rotated and truncated periodically.

To use this log enter the IPMC CLI and cat or grep to find the information you are looking for. For example to find which payload stage's watchdog timer expired run the following command:

```
cat /var/log/messages | grep expired
```

7.7 Behavior of IPMI Resets

The PP50 supports the following types of IPMI resets.

7.7.1 IPMI Cold Reset

During the IPMI Cold Reset all board devices are reset. The same actions are taken when the CNode is rebooted using Linux "reboot" command.

7.7.2 IPMI Watchdog Reset

There are two levels of watchdog functionality in the CNode:

- Linux Application Level
- Hardware Level

7.7.2.1 Linux Application Level

Certain CCPU applications and daemons (ipmcd, rfswitchd, ipmc-cli) are monitored by a parent process. For example, rfswitchd forks to a child process, also named rfswitchd. If the child terminates, the parent will restart it. The exceptions to this are if the termination is due to the child receiving a SIGTERM or SIGKILL. In this case, the parent will terminate itself via a call to exit(). This behavior allows the user or another process to kill an application-level-protected process.

7.7.2.2 Hardware Level

Certain user applications require an autonomous reset of the system under certain fatal conditions. The hardware-level watchdog monitors two software entities:

- u-boot (the boot monitor)
- ipmcd (the IPMI control daemon running in linux).

The u-boot watchdog resets the CNode (which power-cycles the payloads) if Linux fails to boot. The ipmcd watchdog will reset the CNode if ipmcd hangs or stops execution for any reason.

The CCPU hardware watchdog is a discrete chip that continues to operate even if the processor(s) are not.

The key value "cn_hw_watchdog" controls the watchdog period. If it exists and has a non-zero value, the hardware watchdog is programmed to fire (reset the CNode) in [cn_hw_watchdog] seconds. The responsible software entity (u-boot or ipmcd) is responsible for re-starting the hardware watchdog periodically - before it has a chance to fire. If the key value database item "cn_hw_watchdog" is set to zero or is non-existent, the hardware watchdog is disabled.

If the watchdog period is to be changed, the user must be very careful in specifying the interval and setting it. Each CCPU product has a minimum period that is used for u-boot. The ipmcd daemon, however, does not adhere to a minimum value. Thus it is possible to set the value such that ipmcd can never launch, and the blade suffers continuous resets. For example, the recommended interval for a PP50 is at least 180 seconds.

If a user inadvertently sets the "cn_hw_watchdog" key value to a value that is too short, the following procedure can be used to recover:

1. There must be a physical serial console connected to the CNode.
2. Immediately after the CNode resets, start tapping any key. This will prevent u-boot from exiting into linux.
3. As soon as there is a user prompt, type

```
kv -d cn_hw_watchdog
```

This removes the key value, thus disabling the hardware watchdog.

7.7.3 IPMI Firmware Upgrade Reset

After a new version of IPMC firmware is written to alternate bank (non-active bank), rollboot command is used to switch the bank and boot new firmware. During this rollboot command, OS is rebooted and subsequently all the devices on the board are reset.

7.8 IPMC Command Line Interface

The CNode provides an IPMC command line interface (IPMC-CLI) to control and configure IPMC resources on the board. The IPMC-CLI connects to the IPMC daemon (ipmcd) over an RMCP channel established locally and acts as a RMCP client of the IPMC daemon, therefore the IPMC-CLI only works when an IPMC daemon is running in the system.

The IPMC daemon is started by the CNode Linux boot startup scripts; by default the daemon is running when one logs into the CNode.

The IPMC-CLI can be run either in an interactive mode or in a non-interactive mode.

In interactive mode, the IPMC-CLI is invoked by running "ipmc-cli" from CNode Linux prompt. It displays a CLI prompt where user needs to enter a command. On command completion, the CLI returns back to its prompt. The CLI prompt is shown below.

```
pp50-<address>-ipmc-cli >
```

Where,

address - ipmb slave address of the board in the chassis.

Example:

```
pp50-0x86-ipmc-cli>
```

To exit from CLI, either type "quit" and hit enter key or press Control-c (^c).

Note: In the interactive mode of operation, IPMC-CLI does not support command history (pressing up/down arrow key).

In the non-interactive mode, CLI command is entered at the CNode Linux prompt itself as shown below.

```
ipmc-cli <command> [command parameters]
```

The following subsections list all the commands supported by IPMC-CLI and their usage description.

7.8.1 bmc_watchdog

This command is to Get / Set / Reset BMC Watchdog Timer for a payload CPU.

Command syntax:

bmc_watchdog <payId> [on <duration> <action> | off | restart]

Where,

payId - payload id. Run the command "listpay" to get list of all the payloads on the board. To get the current status of watchdog timer, run the command with just the payload id.

on | off - turns on/off timer

restart - restarts an already running timer

duration - timer duration in unit of seconds

action - timer expiry action. Actions can be -

hardreset - hard reset payload on expiry of timer

noaction - timer expiry is logged in SEL and syslog but no action taken on payload

This command sends PICMG command Get/Set/Reset BMC Watchdog Timer to IPMC daemon. When starting the watchdog timer, this command sets OEM into the fields – “Timer Use” and “Timer Use Expiration Flag Clear” bytes of Set BMC Watchdog Timer command.

Example:

```
pp50-0x86-ipmc-cli> bmc_watchdog 0 on 30 hardreset
Set Watchdog Timer successful
pp50-0x86-ipmc-cli> bmc_watchdog 0
BMC Watchdog timer is running
Logging of timer expiry event is enabled
Timer Use: 0x45
Timer Action: Hard reset on expiry of timer
Timer Use Expiration Flag Clear: 0x00
Initial Countdown (Timer Duration): 30 seconds
Present Countdown (Remaining Timer Duration): 20 seconds
```

7.8.2 commit

This command commits current working thresholds and hysteresis values of sensors into persistence as a customer committed defaults.

Command Syntax:

commit <threshhyst>

Example:

```
pp50-0x86-ipmc-cli> commit threshhyst
Commit threshhyst successful
```

7.8.3 debuglevel

This command gets / sets debug level of IPMC daemon process. IPMC daemon process logs information into /var/log/messages as per the debug level set. This command is mostly used for debugging purposes.

Command syntax:

debuglevel [level]

If level is not specified then displays the current debug level of IPMC. If level is specified then sets the debug level of IPMC.

Levels are -

0 - CNLOG_EMERG

1 - CNLOG_ALERT

2 - CNLOG_CRIT

3 - CNLOG_ERR

4 - CNLOG_WARNING

5 - CNLOG_NOTICE

6 - CNLOG_INFO

7 - CNLOG_DEBUG

Example:

```
pp50-0x86-ipmc-cli> debuglevel
IPMC Debug Level is 5 (CNLOG_NOTICE)
pp50-0x86-ipmc-cli> debuglevel 6
IPMC Debug Level set to 6 (CNLOG_INFO)
```

7.8.4 getactivebank

Displays active bank id of a firmware upgradable device. List of firmware upgradable devices on the board can be found by running command “listfwdev”.

Command syntax:

getactivebank <fwDevId>

Where,

fwDevId: Firmware upgradable device id, can be found by running "listfwdev" command.

Example:

```
pp50-0x86-ipmc-cli> getactivebank 0
fwDeviId: 00, Active Bank Id: 0
```

7.8.5 getresetstatus

Displays reset status of a resettable device on the board. List of resettable devices on the board can be found by running command “listdev”.

Command syntax:

getresetstatus <devId>

Example:

```
pp50-0x86-ipmc-cli> getresetstatus 1
Device in reset off state
```

7.8.6 help

Lists all the commands or usage on a particular command.

Command syntax:

help <command name>

When a command name is specified then it displays usage information about that command. When a command name is not specified then it lists all the available commands.

Example:

```
pp50-0x86-ipmc-cli> help
CNode IPMC CLI Command Set - Command name and parameters are case sensitive.
bmc_watchdog <payId> [on <duration> <action> | off | restart]
commit <threshhyst>
debuglevel [level]
getactivebank <fwDevId>
getresetstatus <devId>
kv [ [-p] key | key value | -d key | -h ]
listdev
listfwdev
listpay
localaddress
quit
resetdev <devId>
restore [factory | custom] <threshhyst>
sel [info | clear | rotate <on | off>] [add  <16 bytes (in hex)>]
sendcmd <netFn> <cmd> [data bytes]
setactivebank <fwDevId> <bankId>
setresetstatus <devId> <resetState>
version [all]
```

```
pp50-0x86-ipmc-cli> help version
Display version of the components.
Usage:
                 version [all]
When option "all" is specified then displays version of all the components,
otherwise displays version of IPMC f/w.
```

7.8.7 kv

This command is to manipulate Key-Value database.

Command syntax:

kv [[-p] key | key value | -d key | -h]

Where,

-p : print key name along with value

-d : delete a key

-h : display usage

When no any argument is supplied then lists all the key-values.

Example:

```
pp50-0x86-ipmc-cli> kv
ipmc_version = pp50-ipmc-v2.6.3r00
datetime = 2010-08-13 21:40:39
epochtime = 1281735639
s0_mac_base = 00:02:bb:50:03:90
s1_mac_base = 00:02:bb:50:03:98
xlr0base = 00:02:bb:50:03:90
xlr1base = 00:02:bb:50:03:98
f0_brd_compat = unknown
f1_brd_compat = notinstalled
f2_brd_compat = notinstalled
hwaddr = 43
f1_presence = 0
f2_presence = 0
tcam_fpga_vers = not_present
s0_cur_bank = 1
s1_cur_bank = 1
__pwr_regs = f500000000000000
__f0_poh = 12983
__s0_rstcause = pwrcycle
__s0_rsttime = 2010-08-13 21:38:40
_s0_state = INIT
_s0_fruid = 0
_s0_fwprogid = 9
__s1_rstcause = pwrcycle
__s1_rsttime = 2010-08-13 21:38:40
_s1_state = INIT
_s1_fruid = 0
_s1_fwprogid = 13
__cn_rstcause = cold_reset
```

```
__cn_rsttime = 2010-08-13 21:37:41
s1_next_bank = 1
ipmc_act_bank = 0
cn_test_mask = 1111111100000000000000000000000
ipmc_vers0 = pp50-ipmc-v2.6.3r00
ipmc_vers1 = pp50-ipmc-v2.6.2r00
s0_vers2 = v0x08
s1_vers2 = v0x08
led_vers = v0x04
ethaddr = 00:02:bb:50:03:96
s0_next_bank = 1
s1_btvers1 = pp50-boot-rmi16-v2.6.1r00
s0_btvers1 = pp50-boot-rmi16-v2.6.1r00
```

7.8.8 listdev

Lists all the resettable devices on the board.

Command syntax:

listdev

Example:

```
pp50-0x86-ipmc-cli> listdev
devId 0x00: XLR0
devId 0x01: XLR1
```

7.8.9 listfwdev

Lists all the firmware upgradable devices on the board.

Command syntax:

listfwdev

Example:

```
pp50-0x86-ipmc-cli> listfwdev
fwDevId 0x00: XLR0
fwDevId 0x01: XLR1
```

7.8.10 listpay

Lists all the payloads on the board.

Command Syntax:

listpay

Example:

```
pp50-0x86-ipmc-cli> listpay
payload id 0x00: XLR0
payload id 0x01: XLR1
```

7.8.11 localaddress

Displays Logical slot id, HW address and IPMB Slave address of the board.

Command syntax:

localaddress

Example:

```
pp50-0x86-ipmc-cli> localaddress
Logical slot id: 0x03, HW Address: 0x43, IPMB Slave Address: 0x86
```

7.8.12 quit

Use this command to exit the CLI. Alternatively, you can also press Control-c(^c) to exit from the CLI.

This command gracefully shuts down the ipmc-cli. During shutdown it closes the RMCP session with IPMC daemon. Always gracefully exit from the IPMC-CLI to avoid hanging sessions on the IPMC daemon side. Future release of ipmc f/w may support periodic audit of RMCP sessions at IPMC daemon to clear all the idle sessions.

7.8.13 resetdev

Hard resets a device on the board. List of resettable devices on the board can be found by running command “listdev”.

Command syntax:

resetdev <devId>

Example:

```
pp50-0x86-ipmc-cli> resetdev 0
Device reset successful
```

7.8.14 restore

Restores sensor thresholds and hysteresis data to either factory defaults or customer committed default values.

Command syntax:

restore [factory | custom] <threshhyst>

Note: This command replaces customer committed thresholds and hysteresis data with factory default values and loads those factory default values into working copy in RAM.

Example:

```
pp50-0x86-ipmc-cli> restore factory threshhyst
Restore factory default of threshhyst successful
```

7.8.15 sel

This command is for onboard SEL device.

Command syntax:

sel [info | clear | rotate <on | off>] [add <16 bytes (in hex)>]

Where,

The command without any parameters displays all log entries.

info - display SEL version, free space, time stamp etc.

clear - clear all the entries in SEL

rotate <on | off> - turn ON/OFF SEL overwrite in circular fashion

add - add 16 bytes of entry (in hex) into the SEL

Note: IPMC only logs most critical events in the on-board SEL.

Example:

```
pp50-0x86-ipmc-cli> sel info
SEL Version: 1.5
Number of log entries: 1
Free Space (in bytes): 4048
Most recent addition timestamp: 2010-08-12 14:33:05
Most recent erase timestamp: 2010-08-11 00:32:37
Supported operations: 0x00
```

```
pp50-0x86-ipmc-cli> sel
0x0001: Event: at 2010-08-12 14:33:05; from:(0x86,0x00,0x00); sensor:(0x23,0x0c);
event: 0x6f(asserted); event data1: 0x01, event data2: 0x05, event data3: 0x00
```

7.8.16 sendcmd

Sends a RAW IPMI message to IPMC daemon process.

Command syntax:

sendcmd <netFn> <cmd> [data bytes]

All parameters should be in Hex.

Where,

netFn: Net function as per ATCA/IPMI specification
cmd: Command code byte as per ATCA/IPMI specification
parameters: Command parameters bytes.

Example:

The Get Address Info command (netFn: 0x2c, cmd: 0x01) for Fru# 0 is:

```
pp50-0x86-ipmc-cli> sendcmd 0x2c 0x01 0x00
Command successful - completion code: 0x00
Data bytes - 0x00 0x00 0x43 0x86 0xff 0x00 0x00 0x00
```

7.8.17 setactivebank

Sets active bank of a firmware upgradable device so that on next reboot of that device, f/w from new selected bank is used. List of firmware upgradable devices on the board can be found by running command “listfwdev”.

Command syntax:

setactivebank <fwDevId> <bankId>

Where,

Bank Id can be either 0 or 1.

Example:

```
pp50-0x86-ipmc-cli> setactivebank 0 1
Set Active Bank of device successful
After executing above, command, on next reboot of that device it would boot from
f/w in bank 1.
```

7.8.18 setresetstatus

Holds and releases resettable devices into reset state. List of resettable devices on the board can be found by running command “listdev”.

Command syntax:

setresetstatus <devId> <resetState>

Where,

devId: Device id of resettable device. List of resettable device can be found by running command “listdev”.

Reset status can be:

on - to hold device into reset state

off - to release device from reset state

Example:

```
pp50-0x86-ipmc-cli> setresetstatus 0 on
Set Reset Status of device successful
```

7.8.19 version

Displays IPMC f/w components version on the board.

Command syntax:

version [all]

When option "all" is specified then displays version of all the IPMC f/w components, otherwise displays version of IPMC f/w.

Example:

```
pp50-0x86-ipmc-cli> version
ipmc_version = t20100811-204706-rchuhan

pp50-0x86-ipmc-cli> version all
ipmc_version = t20100811-204706-rchuhan
tcam_fpga_vers = not_present
s0_vers2 = v0x08
s1_vers2 = v0x08
led_vers = v0x04
```

8 Network Configuration

The PP50 has a rich set of networking options that allow the blade to be adapted to varied network architectures. This section begins with a discussion of the capabilities of the onboard Ethernet switch to partition traffic, and then discusses the options available for the Gigabit Ethernet ports, the 10 Gigabit Ethernet ports, the fabric interface, and the base interface. This section ends with a set of typical configurations that are suitable for different network architectures and traffic flows.

As can be seen in Figure 8-1 "Networking Components Diagram", the Ethernet switch is at the heart of the PP50 design. One of the key switch capabilities used by the PP50 is the ability to partition the switch into multiple virtual switches, each of which maintains isolation from the other virtual switches. This virtual switch makes use of VLAN tagging as described in the next section.

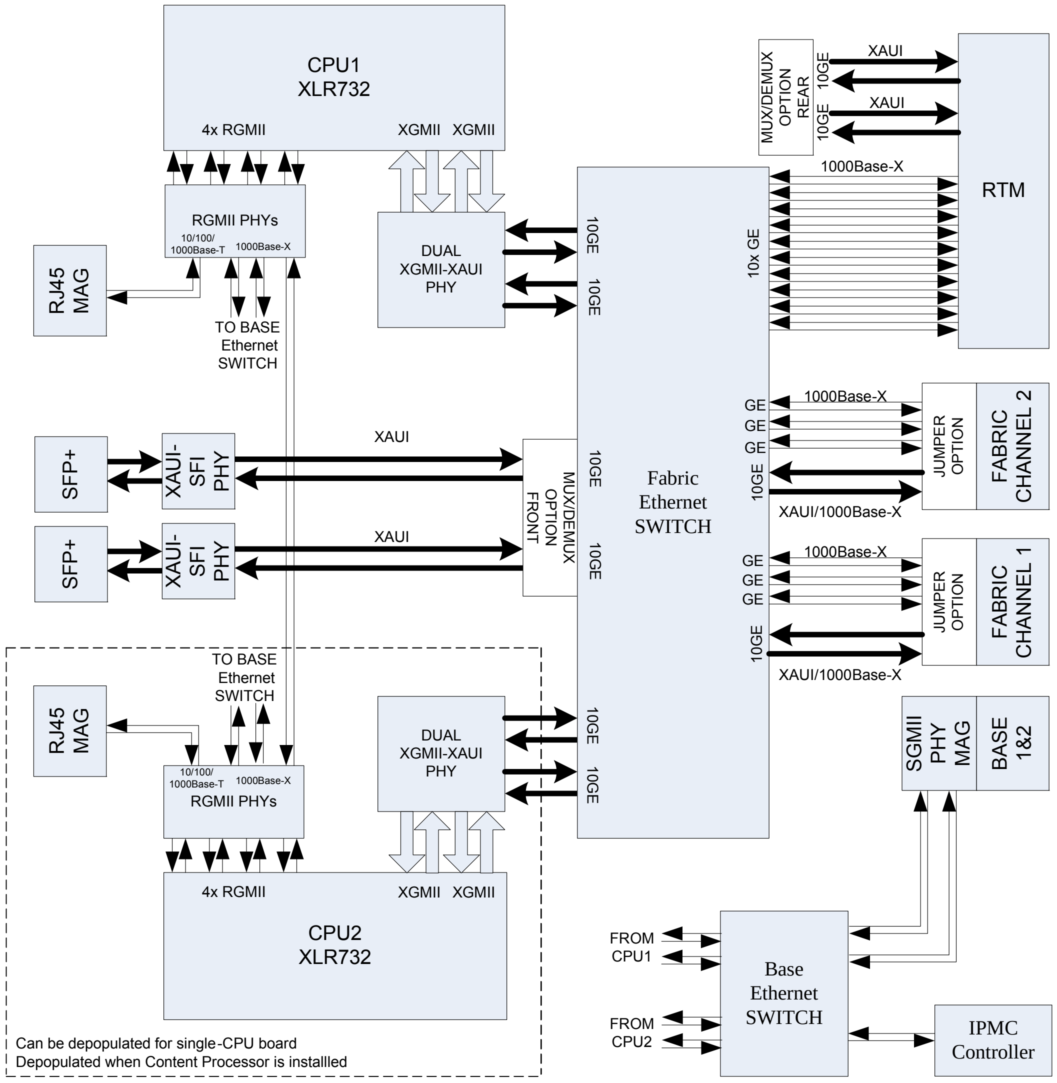


Figure 8-1: Networking Components Diagram

8.1 Fabric Switch Models

Two build variants (models) of the PP50 are available for order from the factory.

- 10GbE capable Ethernet model which supports:
  - PICMG 3.1 Option 1 - One 1 GbE Ethernet link on each of the two fabric channels.
  - PICMG 3.1 Option 9 - One 10 GbE Ethernet link on each of the two fabric channels.
- 1GbE capable Ethernet model which supports:
  - PICMG 3.1 Option 1 - One Gigabit Ethernet on each fabric channel.
  - PICMG 3.1 Option 2 - Two Gigabit Ethernet on each fabric channel.
  - PICMG 3.1 Option 3 - Four Gigabit Ethernet on each fabric channel.

The vast majority of customers choose the 10 GbE model.

The fabric switch is configured by the fswd daemon which runs under Linux on the IPMC as part of the payload powerup process. The default configuration is to partition the switch into two separate network domains using port based VLANs.

Any user configuration script may be required to first delete ports from the pre-configured port based VLANs (VIDs 2 & 3) before creating new VLAN networks.

8.2 Fabric Switch Management

This section describes the commands and utilities used to manage the fabric switch.

Note: The current default Fabric Switch configuration is set for generic PP50 RTMs. To work with COP50 RTMs the VLAN configuration must be changed (see example below). Also note more complex configurations with additional VLANs may also be necessary.

```
VLAN  2:
    ... other ports omitted ...
    port 15  RTM1        UNTAG
    port 17  RTM3        UNTAG
    port 19  RTM5        UNTAG
    port 21  RTM7        UNTAG
    port 23  RTM9        UNTAG
VLAN  3:
    ... other ports omitted ...
    port 16  RTM2        UNTAG
    port 18  RTM4        UNTAG
    port 20  RTM6        UNTAG
    port 22  RTM8        UNTAG
    port 24  RTM10       UNTAG
```

8.2.1 Managing the Fabric Switch with fswcmd

The fswcmd command is used to control the fabric switch after it is initialized. The command typically runs from the CNODE (IPMC running a Linux shell) prompt. It opens a socket interface onto the fswd daemon and essentially simply exchanges command and response strings with the daemon. The switch management logic resides in the fswd daemon.

For convenience, below is a list of fswcmd commands. Details of each command follow the list.

- autopause
- reload
- show stats
- clear
- route
- set port
- enable/disable port
- enable/disable port e-keying
- enable/disable ingress vlan

- enable/disable accept untagged port
- set port default
- add vlan
- del vlan
- show
- SFP Commands
- show Commands
- cfgreg
- dump
- show version
- dump
- enable | disable mac-learning
- enable | disable flooding broadcast
- high and low watermark range
- enable | disable protocol-traps
- show link
- MAC aging

8.2.1.1 autopause

By default the switch is in auto-pause mode and adjusts QOS parameters such as the watermark.

```
fswcmd disable auto-pause
```

Disables the auto-pause mode of the switch. The switch does not adjust QOS parameters such as Watermark if auto pause is disabled.

```
fswcmd enable auto-pause
```

Enables the auto-pause mode of switch (default). The switch adjusts QOS parameters such as Watermark if auto pause enabled.

```
fswcmd show auto-pause
```

Displays if auto-pause mode is enabled or disable for the switch.

8.2.1.2 reload

```
fswcmd reload config [<path><filename>]
```

Re-configures the fabric switch according to the config file. This command resets the switch and reconfigures it into the default configuration before running the identified configuration file.

When the switch management daemon is activated, the config file is set by the key-value entry fswitchCfg. If the <filename> is not entered, the default filename /etc/fswitchCfg.def will be used, even if the key-value "fswitchCfg" is changed afterwards.

8.2.1.3 show stats

```
fswcmd show stats {all|<port id>|<port label>}
```

Displays the port statistics.

8.2.1.4 clear

```
fswcmd clear stats
```

Clears all ports' statistics.

8.2.1.5 route

```
fswcmd route port {rtm|faceplate}
```

Routes the two SFP+ ports to the RTM or faceplate. Note, they are both routed to the faceplate by default.

8.2.1.6 set port

```
fswcmd set port speed {<port id>|<port label>} <speed>
```

Sets the speed of the designated port.

<speed>: [0, 10, 100, 1000, 10000]Mbps

Please note the following regarding this command:

- If the EXTXG[1,2] speed is set to zero, the port speed will be configured according to the SFP(+) module installed
- If the FAB[1,2]x speed is set to zero, the port speed is determined by ekeying
- E-Keying Can be Enabled or Disabled per port
- Front/Back 10G ports have 0,1G or 10G speed only
- If the RTM[1,10] speed is set to zero, the port speed will be 10/100/1000 BASE-T auto-negotiation
- Only OPTONE GLC-T-B Copper SFP supports 10/100/1000 BASE-T in RTM

Fiber and other Copper SFPs support force speed 1000M only in RTM

```
fswcmd set port mtu {<port id>|<port label>} <mtu>
```

Sets the mtu of the designated port

<mtu>: maximum frame size in bytes

Note, a specified value will be rounded down to the nearest multiple of 4.

```
fswcmd set port tx-wm {<port id>|<port label>| all} <tx-wm>
```

Applies the Transmit Watermark on the designated port in Kilobytes

<tx-wm>: Range (255 - 1023)

Note: Transmit Watermark is not supported on Bali silicon.

```
root@cnode-pp50:~ fswcmd set port tx-wm&rx-wm 1 1000
Tx Watermark Unsupported on Bali currently
fswcmd set port rx-wm {<port id>|<port label> | all} <rx-wm>
```

Applies the Receive Watermark on the designated port in kilobytes.

<rx-wm>: Range (255 - 1023)

```
fswcmd set port store-forward {<port> <port label> | all} <value>
```

Sets the Store forward Matrix from this source port to [1 . . 24] destination ports. This command should not be required in normal operation and its use is to be avoided if at all possible.

- The default value is 0xFE000001 and bit 0 corresponds to CPU port .
- 1 and 0 in bit positions 1 to 24 in Matrix are Store Forward and Cut Through respectively.
- If the speed of this port is less than that of destination port, then (store forward) is recommended.
- Store Forward Matrix is logical port map which sets the physical port accordingly.

8.2.1.7 enable/disable port

```
fswcmd enable port {<port id>|<port label>}
```

Enables the designated port.

```
fswcmd disable port {<port id>|<port label>}
```

Disables the designated port.

8.2.1.8 enable/disable port e-keying

This command allows a system administrator to enable or disable e-keying on ports specified ports.

```
fswcmd enable | disable e-key <port id| port label> | <all> \n);
```

The command applies to logical port s 7 through 14, FAB1X, FAB2X, FAB1 (A-D), or FAB2 (A-D).

E-key is enabled by default. Inclusion of multiple non fabric ports is ignored.

By default, fabric ports process e-key messages. There may be times when these messages should be ignored. For example, if a system is using paddle boards instead of a switch (an FM40 for example), when the ShMC is rebooted, the fabric ports will be turned off because e-keying indicates there is no peer device to connect to. Disabling e-keying allows the fabric ports to remain open.

8.2.1.9 enable/disable ingress vlan

```
fswcmd enable | disable ingress-vlan-filter <port> | all
```

Enables or disables ingress VLAN filter per port or all ports.

8.2.1.10 enable/disable accept untagged port

```
fswcmd enable | disable accept-untagged <port> | all
```

Enables or disables accepting untagged incoming data on port(s).

Note: On PP50 boards with a Tahoe fabric switch, the tag-on-tag mode setting for a port (also known as Double VLAN Tagging or Q-in-Q) requires that the accept-untagged setting also be enabled. Attempting to use tag-on-tag with accept-untagged mode disabled will result in all ingressing packets being dropped on that port. To find out if your PP50 has a Tahoe or Bali fabric switch, use the "fswcmd show version" command on the IPMC.

```
fswcmd set port tag-mode {<port id>|<port label>|all} {tag-on-tag|normal}
```

Sets the tag mode of the designated port(s).

tag-on-tag : If the frame leaves the switch tagged, it gets an additional VLAN tag. If the frame leaves the switch untagged, then any original VLAN is preserved, but this tag is not added.

normal : the VLAN rules pertain to the traditional VLAN tag only.

8.2.1.11 set port default

```
fswcmd set port default-vlan {<port id>|<port label>|all} <vlan-id> [<priority>]
```

Sets the defaut VLAN ID and priority of the designated port(s).

[<priority>] : the default priority, 0 by default.

8.2.1.12 add vlan

```
fswcmd add vlan <vlan id> {<port id>|<port label>|all} {tag|untag}
```

Adds port(s) to the designated VLAN ID.

tag : Frames leaving the port(s) will keep the VLAN tag.

untag : Frames leaving the port(s) will remove the VLAN tag.

8.2.1.13 del vlan

```
fswcmd del vlan <vlan id> {<port id>|<port label>|all}
```

Removes port(s) from the designated VLAN ID.

8.2.1.14 show

```
fswcmd show vlan {all|<vlan id>}
```

Displays the designated VLAN configuration.

Note: Output from this command varies depending on whether you have Bali or Tahoe silicon. Bali silicon supports egress blocking so the per VLAN egress block of ports is shown for a Bali Board. Tahoe does not support egress blocking, hence there is a difference output.

```
fswcmd show port {<port id>|<port label>|all}
```

Displays the designated port's configuration.

8.2.1.15 SFP Commands

```
fswcmd start monitor <seconds>
```

Starts monitoring the status of the SFP(+) ports. If there is any status change, the daemon will report <seconds> : monitor stop after the time if the value is 0, monitoring will not stop.

```
fswcmd stop monitor
```

Stops monitoring the status of the SFP(+) ports.

8.2.1.16 show Commands

```
fswcmd show sfp
```

Displays the status of the SFP(+) ports.

```
fswcmd show switch flooding
```

Shows the forwarding/flooding states.

```
fswcmd show mtu
```

Displays the MTU value of each port.

8.2.1.17 cfgreg

```
fswcmd cfgreg <file>
```

Configures switch with commands specified in the file.

file : the special raw registers file.

8.2.1.18 dump

```
fswcmd dump switch {global|port <port>}
```

Dumps the registers of the switch.

```
fswcmd dump phy {extxg1|extxg2}
```

Dumps the registers of the PHY chip.

```
fswcmd dump route
```

Dumps the registers of the port routing chip.

8.2.1.19 show version

```
fswcmd show version
```

Displays the current fswcmd version. For example:

```
root@cnode-pp50:/usr/bin fswcmd show version
  Switch      type ----------Tahoe::2112
  Silicon  version ----------A5
  Firmware version ----------pp50-ipmc-v2.3.3d01
```

8.2.1.20 dump

```
fswcmd dump mac-info verbose | all | <number of entries (1 - 16384)
```

Dump mac info, displays the mac table entries in the fabric switch. When mac address learning is enabled on PP50, you may track a host of mac addresses and their states along with the cache values.

Verbose displays only the count of mac table entries.

Shows all mac table info or specified number of entries.

8.2.1.21 enable | disable mac-learning

```
fswcmd enable | disable mac-learning <port>| all
```

Enables or disables mac-learning on port.

8.2.1.22 enable | disable flooding broadcast

```
fswcmd enable | disable flooding broadcast | multicast | unicast
```

Globally enables or disable flooding of broadcast, multicast and unicast frames.

8.2.1.23 high and low watermark range

```
fswcmd high-wm <value>
```

Sets High Watermark Range (540 - 4095) in Kilobytes.

```
fswcmd low-wm <value>
```

Sets Low Watermark Range (540 - 4095) in Kilobytes.

8.2.1.24 enable | disable protocol-traps

```
fswcmd enable | disable protocol-traps {broadcasts | 8021x | igmpv3 | bpdu | lacp
| other | mtu-error | all}
```

- Enable Allows (Broadcasts, 802.1x, IGMPv3, GARP, BPDU,LACP, Other (slow protocols)) to be trapped and discarded.
- Disable Prevents (Broadcasts, 802.1x, IGMPv3, GARP, BPDU, LACP, Other (slow Protocols) to be trapped and discarded.
- enable | disable protocol traps {all} will enable or disable all above mentioned traps
- Note, by default Bali chips have no IGMPv3 traps enabled and Tahoe chips do not have MTU violation traps.

8.2.1.25 show link

```
fswcmd show link {all|<port id><port label>}
```

Displays the port link status. Example below.

```
fswcmd show link
Switch Type: Tahoe
PORT LABEL   SPEED ADMIN STATE RUNNING STATE LANE  1 LANE  2 LANE  3 LANE  4
---- ------- ----- ----------- ------------- ------- ------- ------- -------
1    FPXG1   0G    Enabled     DOWN          NoSym   NoSym   NoSym   NoSym
2    FPXG2   0G    Enabled     DOWN          NoSym   NoSym   NoSym   NoSym
3    XLR0XG0 10G   Enabled     UP            SymLok  SymLok  SymLok  SymLok
4    XLR0XG1 10G   Enabled     UP            SymLok  SymLok  SymLok  SymLok
5    XLR1XG0 10G   Enabled     UP            SymLok  SymLok  SymLok  SymLok
6    XLR1XG1 10G   Enabled     UP            SymLok  SymLok  SymLok  SymLok
7    FAB1X   10G   Disabled    Power DOWN    NoSym   NoSym   NoSym   NoSym
8    ----    1G    Disabled    Power DOWN    NoSym   Unused  Unused  Unused
9    ----    1G    Disabled    Power DOWN    NoSym   Unused  Unused  Unused
10   ----    1G    Disabled    Power DOWN    NoSym   Unused  Unused  Unused
11   FAB2X   10G   Disabled    Power DOWN    NoSym   NoSym   NoSym   NoSym
12   ----    1G    Disabled    Power DOWN    NoSym   Unused  Unused  Unused
13   ----    1G    Disabled    Power DOWN    NoSym   Unused  Unused  Unused
14   ----    1G    Disabled    Power DOWN    NoSym   Unused  Unused  Unused
15   RTM1    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
16   RTM2    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
17   RTM3    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
18   RTM4    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
19   RTM5    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
20   RTM6    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
```

```
21   RTM7    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
22   RTM8    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
23   RTM9    1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
24   RTM10   1G    Enabled     Power DOWN    NoSym   Unused  Unused  Unused
```

8.2.1.26 MAC aging

Controls the MAC address age out time in seconds.

```
root@cnode-pp50:/usr/bin fswcmd show aging
Aging = 15
root@cnode-pp50:/usr/bin
root@cnode-pp50:/usr/bin fswcmd set aging
Set Aging = 0
root@cnode-pp50:/usr/bin
root@cnode-pp50:/usr/bin fswcmd set aging 30
Set Aging = 30
root@cnode-pp50:/usr/bin
root@cnode-pp50:/usr/bin fswcmd show aging
Aging = 30
```

8.2.2 fswcmd Start Up File

The /etc/fswitchCfg.def file can be used to run fswcmd commands at startup. By default it is empty.

The syntax is simply the command parameters as you would pass to fswcmd. Each individual command goes on its own separate line (example below).

```
add vlan 1088 xlr0xg0 tag
add vlan 1089 xlr0xg0 tag
...
add vlan 1147 xlr1xg0 tag
disable ingress-vlan-filter fab1x
disable ingress-vlan-filter fab2x
```

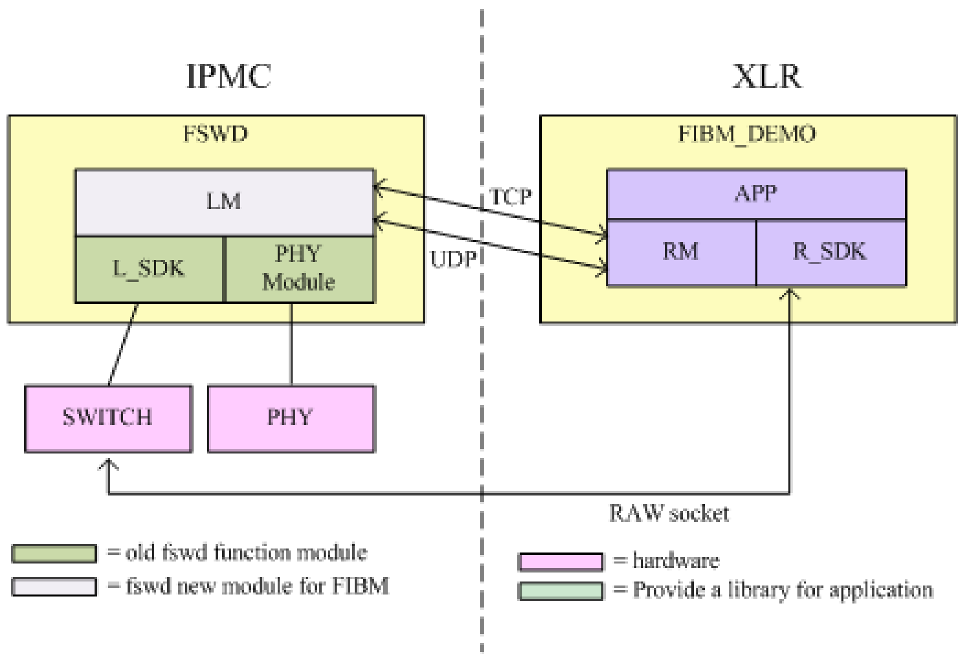
8.2.3 FIBM Mode

Note: Contact your Continuous Computing representative for further details regarding using FIBM.

Note: FIBM is only supported on Wind River (WR PNE LE).

Fulcrum In Band Management (FIBM) was made available in the PP50 release 1.3 Update 2. A Local Management (LM) module was added that allows the switch to be bootstrapped into FIBM mode. In this mode, fswd does not use the local SDK to read or write fulcrum registers. The CLI, web interface, and SNMP are also disabled.

Figure 8-2: Fulcrum In Band Management (FIBM)


IPMC
XLR
FSWD
LM
L_SDK
PHY Module
FIBM_DEMO
APP
RM
R_SDK
TCP
UDP
SWITCH
PHY
RAW socket
= old fswd function module
= fswd new module for FIBM
= hardware
= Provide a library for application

8.2.3.1 Enabling FIBM Mode

Follow the instructions below to enable the board for FIBM mode.

1. Set KV key as shown below:

   'cn_fibm_enable' as "fibm XLR0XG0 10.4.41.136 10541"

   where

'fibm'	flag, fswd working on fibm/normal mode.
'XLR0XG0'	device for switch control by remote SDK. XLR0XG0 - cpu xlr0 eth4 port XLR0XG1 - cpu xlr0 eth5 port XLR1XG0 - cpu xlr1 eth4 port XLR1XG1 - cpu xlr1 eth5 port
'10.4.41.136'	ipmc TCP address, used to communicate with the user.
'10541'	ipmc TCP port, used to communicate with the user.

2. Reboot the board.

8.3 Base Switch Management and Port Connectivity

The base switch lets you add a port specific tag to an incoming packet and multiple VLAN tagging (with no inherent limit other than packet length). These abilities allow the PP50 to work with packets that are already singly or doubly tagged.

The base switch supports removing the outermost VLAN tag as the packet egresses from the switch. This allows the VLAN partitioning to occur transparently to the application and end devices, and allows the one physical switch to function as multiple independent virtual switches.

Aport can be a member of multiple VLANs and packets exiting the switch can retain the VLAN tag identifying which VLAN the packet belongs to. This mode allows a single physical port to send traffic to multiple destination networks on a packet by packet basis.

The Ethernet data path is facilitated through a 10GbE capable switch. The FM2112 contains eight 10GbE interfaces and sixteen 1GbE interfaces.

The fabric interface to the AdvancedTCA backplane can be configured as a build time option for 10GbE or for up to 4x 1GbE operation. In 10GbE operation, Ports 7 and 5 are wired to all 4 ports in channels 1 and 2. In four 1GbE operation, Ports 7 and 5 are put in 1GbE mode and make up the ‘A’ ports of the two fabric channels. Switch ports [15 19 13] make up ports [b c d] for channel 1, and likewise switch ports [21 11 9] make up ports [b c d] for Fabric channel 2.

8.3.1 Default Behavior

The linux ethernet driver in the IPMC had originally been modified to enable using the Broadcom BCM5389 switch in a “statically managed” mode. This allowed the processor with a single ethernet NIC to present two virtual broadcast domains (A and B) to the system. A VLAN with ID 4094 was established at startup time, and any entity wishing to send packets to the ‘B’ network needed to use that VLAN.

Table 8-1: Virtual Broadcast Domains

Network A	Network B
XLR0 gmac2	XLR0 gmac3
XLR1 gmac2	XLR1 gmac3
Base Channel A	Base Channel B

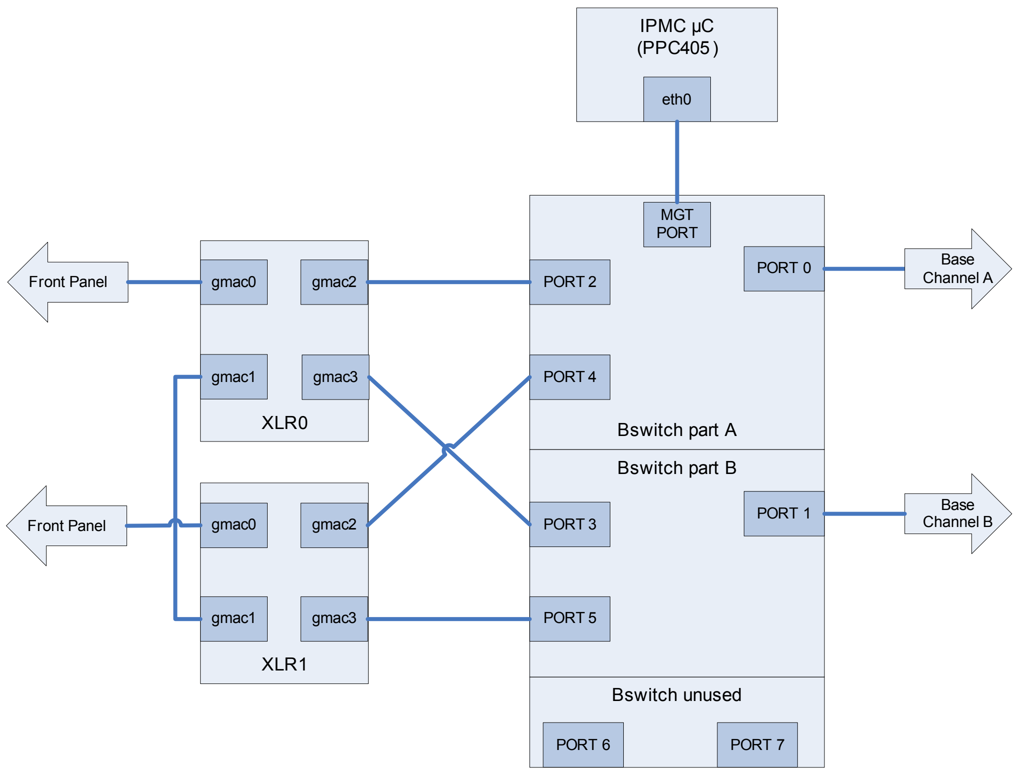


Figure 8-3: PP50 Channel A and B Networks

8.3.1.1 Broadcom Management Tag (BMT)

A limited set of commands can be issued to the BCM5389 with a 6-byte tag (BMT) that is inserted by the driver on egress from the processor, and by the switch on ingress to the processor. On egress from the NIC, the driver inserts an opcode of 0x60 and an argument of either:

1. 0xd5 for the channel ‘A’ destinations if there is no VLAN tag in the packet received from the upper layers OR
2. 0x2a for the channel “B” destinations if there is any VLAN tag, regardless of ID. The VLAN tag will be stripped.

On ingress to the NIC, the driver removes the BMT. If the packet ingressed to the bswitch from one of the base channel B ports, a VLAN tag with an ID of 4094 is inserted from the base channel B ports or does nothing for packets ingressing from base channel A ports.

Table 8-2: VLAN assignment to ingress packets

Ingressing from bswitch port	connection	Action
0	Base Channel A	none
1	Base Channel A	insert VLAN ID 4094
2	XLR0 gmac2	none
3	XLR0 gmac3	insert VLAN ID 4094
4	XLR1 gmac2	none
5	XLR1 gmac3	insert VLAN ID 4094
6	none	none
7	none	none

8.3.1.2 Register Initialization in u-boot

For frames ingressing on bswitch ports other than the management port, an additional mask can be laid over the BMT egress map.

An ingress mask is applied to the bswitch at u-boot time, and persists in linux. The mask applies to ingress packets at each port. For this discussion, the former will be known as “selective-mask” and the latter will be “flooded.”

Table 8-3 "Selective-mask bswitch Ingress Masks" and Figure 8-4 "Selective-mask bswitch Ingress Masks" show an example ingress mask. The ingress mask can be changed in Linux using the virtual emac method if desired.

Table 8-3: Selective-mask bswitch Ingress Masks

For frames ingressing at Port	Mask	Binary	Allows Egressing at Port
0	111	1 0001 0001	0,4,8
1	122	1 0010 0010	1,5,8
2	0cc	0 1100 1100	2,3,6,7
3	0cc	0 1100 1100	2,3,6,7
4	111	1 0001 0001	0,4,8

Table 8-3: Selective-mask bswitch Ingress Masks

5	122	1 0010 0010	1,5,8
6	04c	0 0100 1100	2,3,6
7	18c	1 1000 1100	2,3,7,8
8 (IMP)	1d3	1 1101 0011	0,1,4,6,7,8

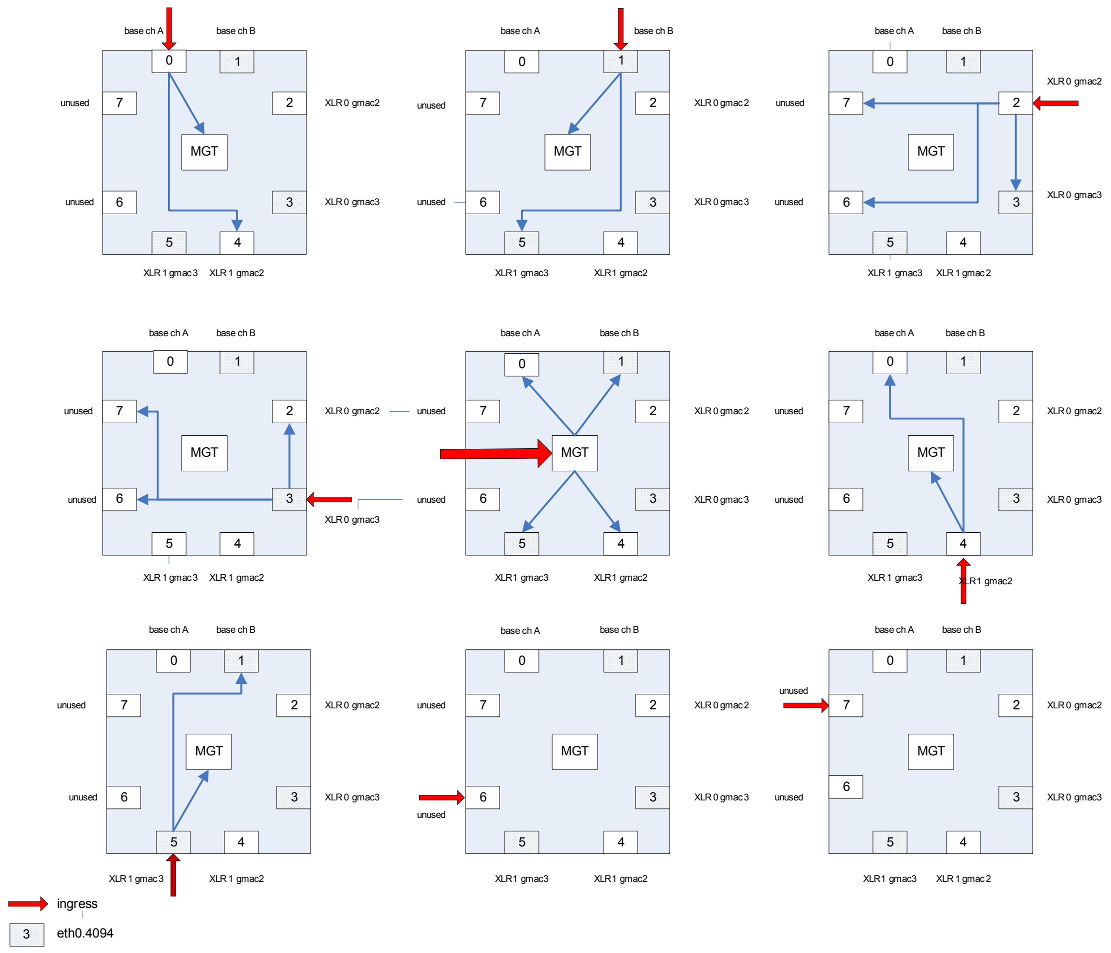


Figure 8-4: Selective-mask bswitch Ingress Masks

8.3.2 Configurable Behavior

For even more powerful selective routing of packets through the bswitch, two other methods are provided. The methods use the same basic steering technique as described above, but instead of using a pre-defined VLAN ID, the IPMC upper network layers are presented with “virtual” (or fake) ethernet NICS. Up to 7 virtual EMACs can be added, giving applications the choice of communicating via eth0, eth1 through eth7.

One method (VLAN Mode) associates a VLAN ID with each virtual EMAC. That VLAN ID is presented to the rest of the system as normal 802.1q packets, but internal to the IPMC there is no VLAN ID. The traffic is identified strictly by which virtual EMAC it appears on.

The other method (BMT Mode) does not attach VLAN headers to system packets – it simply steers the packets through the bswitch depending on which virtual EMAC they belong to.

The power of these schemes is in enabling a bonding driver in the IPMC to be able to switch virtual networks if one of the redundant networks in the system goes down. In other words, it behaves like the other processor elements in the system that have multiple physical NICs.

The same functionality is available on the Continuous Computing FM40 hub switch and XE50 compute blades.

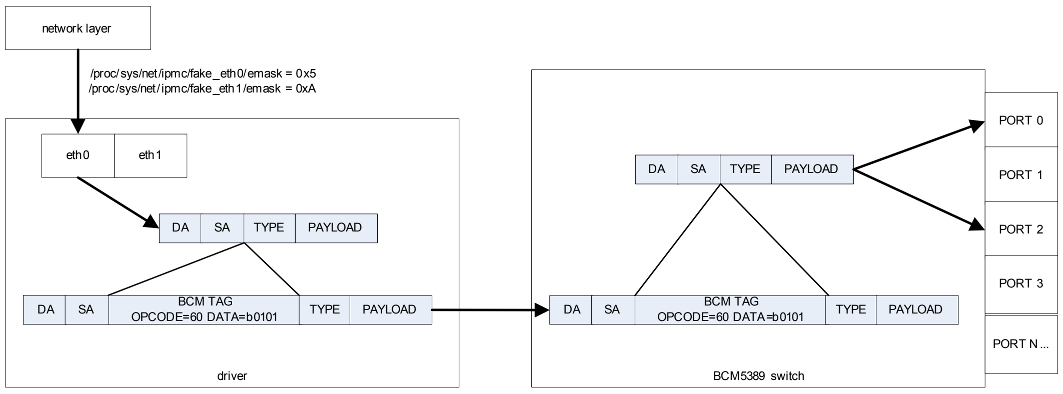


Figure 8-5: BMT Mode eth0 egress

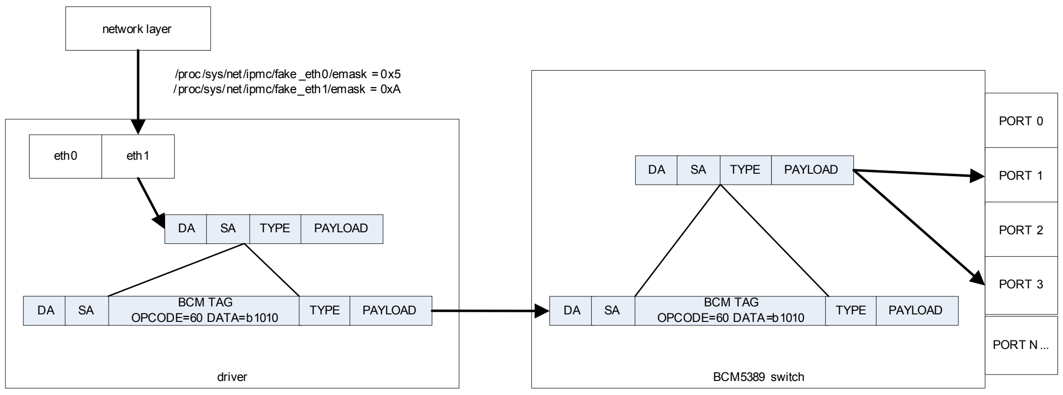


Figure 8-6: BMT Mode eth1 egress

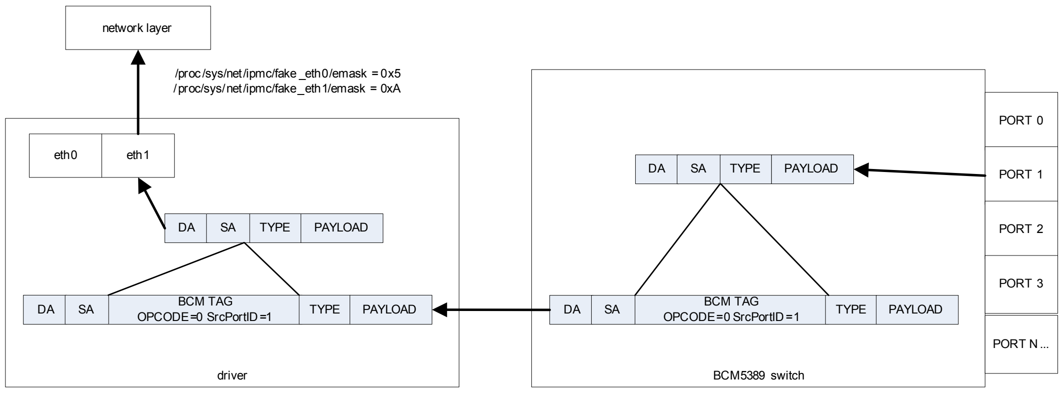


Figure 8-7: BMT Mode eth1 ingress

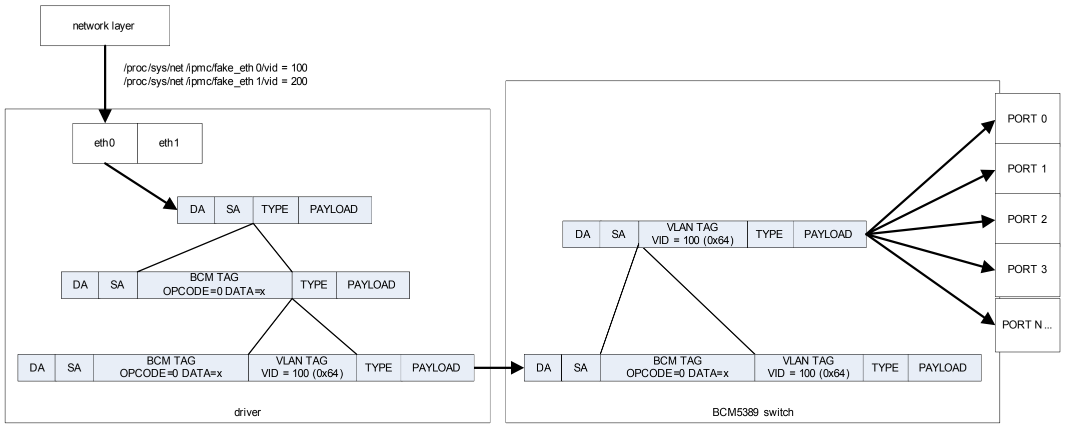

network layer
/proc/sys/net/ipmc/fake_eth0/vid = 100
/proc/sys/net/ipmc/fake_eth1/vid = 200
eth0
eth1
DA SA TYPE PAYLOAD
DA SA BCM TAG OPCODE=0 DATA=x TYPE PAYLOAD
DA SA BCM TAG OPCODE=0 DATA=x VLAN TAG VID = 100 (0x64) TYPE PAYLOAD
driver
DA SA VLAN TAG VID = 100 (0x64) TYPE PAYLOAD
DA SA BCM TAG OPCODE=0 DATA=x VLAN TAG VID = 100 (0x64) TYPE PAYLOAD
BCM5389 switch
PORT 0
PORT 1
PORT 2
PORT 3
PORT N ...

Figure 8-8: VLAN Mode eth0 egress

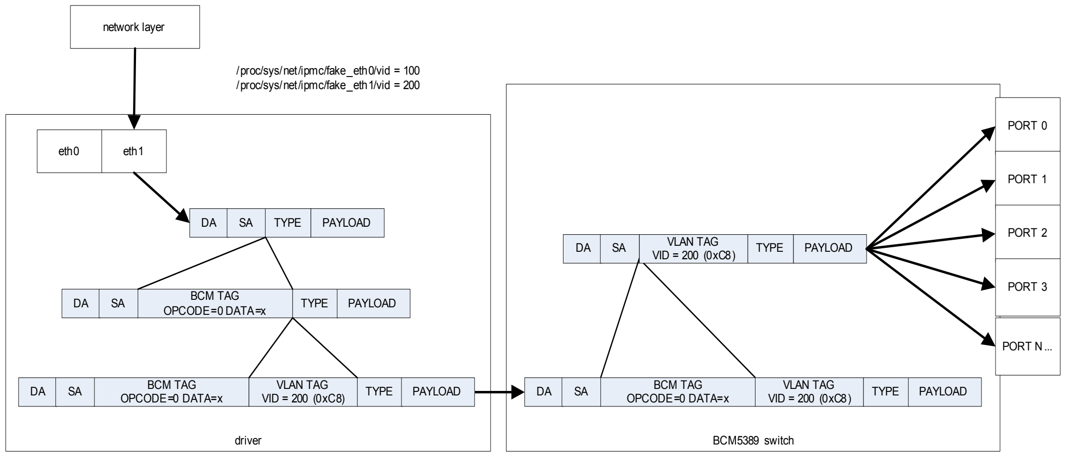

network layer
/proc/sys/net/ipmc/fake_eth0/vid = 100
/proc/sys/net/ipmc/fake_eth1/vid = 200
eth0
eth1
DA SA TYPE PAYLOAD
DA SA BCM TAG OPCODE=0 DATA=x TYPE PAYLOAD
DA SA BCM TAG OPCODE=0 DATA=x VLAN TAG VID = 200 (0xC8) TYPE PAYLOAD
driver
DA SA VLAN TAG VID = 200 (0xC8) TYPE PAYLOAD
DA SA BCM TAG OPCODE=0 DATA=x VLAN TAG VID = 200 (0xC8) TYPE PAYLOAD
BCM5389 switch
PORT 0
PORT 1
PORT 2
PORT 3
PORT N ...

Figure 8-9: VLAN Mode eth1 egress

8.3.3 Alternate bswitch Behavior

The key value “cnswmode” can be used to change the bswitch programming in u-boot.

Table 8-4: cnswmode Values

cnswmode value	Action
hub	network A and B split as described above
static	Same as “hub,” but programs on-blade MAC addresses into learning table to improve CNode processor network performance
flood	All ports connect to all ports. WARNING – can cause network storms if not used with extreme caution – not recommended
“NULL” (no entry)	defaults to “hub” mode

8.3.4 Configuration

The virtual EMACs are configured using the linux “sysconfig” method, which allows the user to control system parameters and behavior via virtual files in the /proc directory.

The *num_of_fakes* and *vlan_method* variables are global to the driver. The num_of_fakes is set by a key value "cnnumofveths". The *vlan_method* variable can be changed in real time.

8.3.4.1 num_of_fakes:

when zero, the ibm_emac driver behaves exactly as it did before any of the virtual EMAC modifications. Only one ethernet interface is presented to the upper network layers. The sysctl files have no effect. When non-zero, the number of ethernet interfaces presented to the upper layers is 1 + n (where n = num_of_fakes).

8.3.4.2 vlan_method

When non-zero, the packets are sent to the BCM5389 with a VLAN tag attached. The VID is set by the sysctl file /proc/sys/net/ipmc/fake_eth***n***/vid.

When vlan_method is zero, there is no VLAN tag. Instead, the Broadcom Management Tag (BMT) is set to opcode 0x60 with the egress mask set by the sysctl file /proc/sys/net/ipmc/fake_eth***n***/emask.

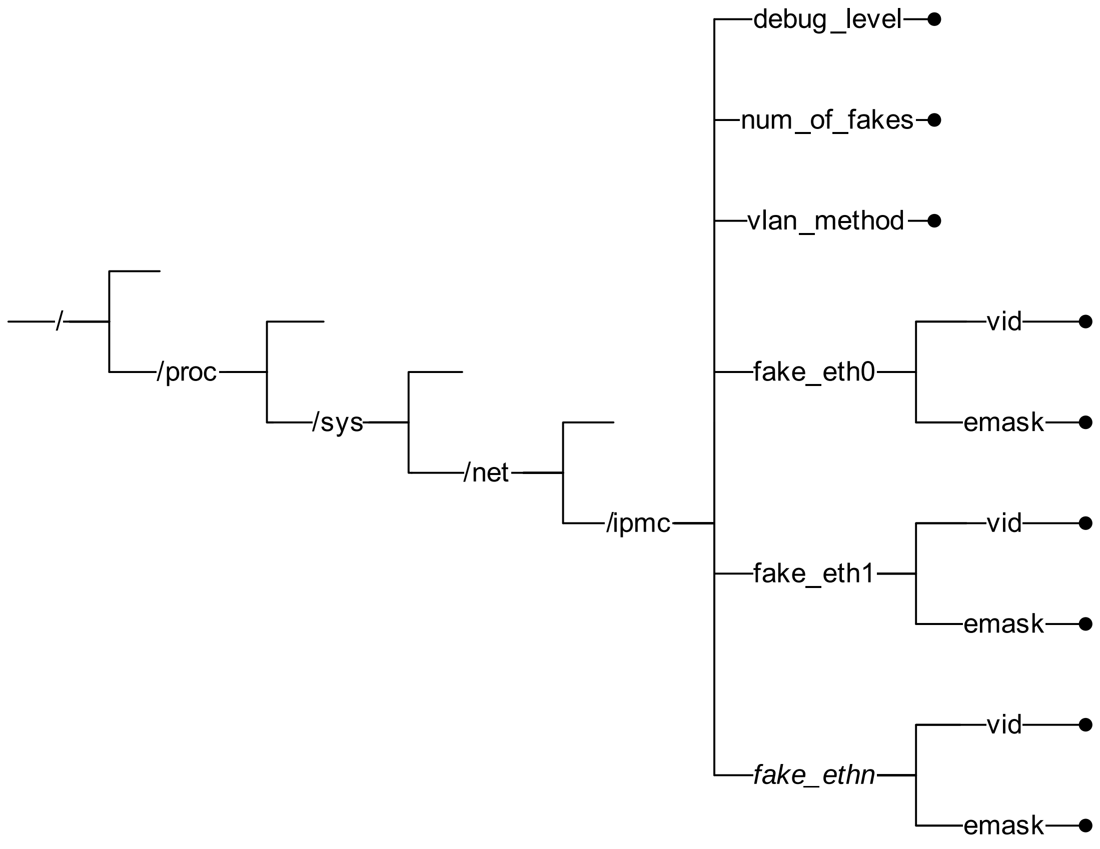


Figure 8-10: sysctl tree

8.3.5 Design Overview

If the CNode key value cnnumofveths is not set or doesn't exist, the driver behaves exactly the same as it did before. Otherwise, a number of virtual (fake) NICs are simulated by the driver. These will all have the same hardware address as the actual NIC, but they can be configured to have unique IP addresses.

8.3.5.1 VLAN mode

In this mode, the driver applies an 8021Q VLAN to the egress packet and examines the VID of ingressing packets. If the VID of an incoming packet is one that is listed in the corresponding sysctl variable, the VLAN tag is stripped and the packet is presented to the appropriate eth interface. For example, if /proc/sys/net/ipmc/fake_eth0/vid is set to 4094 and /proc/sys/net/ipmc/fake_eth1/vid is set to 4093, a packet sent out from eth1 will have the VID 4093 applied at egress. If a packet comes in with a VID of, say 3000, the VLAN tag is left unmolested and the packet is delivered up to the default eth interface (eth0). If the VID had been 4094, the VLAN tag would be stripped and the packet delivered to eth0.

8.3.5.2 BMT Mode

In this mode, an egress mask is applied to the Broadcom Management Tag (BMT) according to a 9-bit mask set in a proc/sys entry for a particular virtual EMAC.

The following mask will flood ports 1, 3 and 5 (0x02a).

Table 8-5: BMT mode Flood Ports

BRCM		**Opcode**		**Forward Map**	
88	74	60	00	00	2a

The following will flood ports 0, 2, 4, 5 and 7 (0x0d5)

Table 8-6: BMT mode Flood Ports

BRCM		**Opcode**		**Forward Map**	
88	74	60	00	00	d5

When a packet is received by the driver from the switch, its BMT is examined for the source port information. The /proc/sys/net/ipmc/fake_eth***n***/emask variable is ANDed with the source port value. The emask variables are taken in ascending order, so the first match is the one that is applied. If a match is found, the packet is delivered up to the associated ethernet interface. If no match is found, the packet is discarded. For example, if /proc/sys/net/ipmc/fake_eth0/emask is set to 0x05 and /proc/sys/net/ipmc/fake_eth1/emask is set to 0x0a, a packet from the switch with BMT source port field = 0x04 (from port 3) will be presented to eth1. A packet with BMT source port = 0x10 (from port 4) will be discarded.

8.3.6 Key Value Database Syntax

This is the default mode of configuring the product. The key name is "cnnumofveths" (short for CNode number of virtual ethernets)

If cnnumofveths is non-existent, the driver will initialize the num_of_fakes variable to 0 and default behavior is preserved.

8.3.7 Examples

8.3.7.1 VLAN method

Set key value and reboot

```
cnodekv cnnumofveths 1
reboot
```

Set VLAN method

```
echo 1 > /proc/sys/net/ipmc/vlan_method
```

Set eth0 VID to 100 and eth1 VID to 200

```
cd /proc/sys/net/ipmc/
echo 100 > fake_eth0/vid
echo 200 > fake_eth1/vid
```

Bring up eth0 and eth1

```
ifconfig eth0 192.168.43.1
ifconfig eth1 192.168.44.1
```

Set up a remote host to be a member of VLAN 100 and ping IPMC eth0

```
ifconfig eth0 0.0.0.0
modprobe 8021q
vconfig add eth0 100
ifconfig eth0.100 192.168.43.3
ping –I 192.168.43.3 192.168.43.1
```

Ping should be successful.

Remove remote host from VLAN 100 and add to VLAN 200

```
vconfig rem eth0.100
vconfig add eth0 200
ifconfig eth0.200 192.168.44.3
ping –I 192.168.44.3 192.168.44.1
```

Ping should be successful.

8.3.7.2 Mask Method

The following will assign IPMC eth0 to the "A" network and eth1 to the "B" network, see Figure 8-3 "PP50 Channel A and B Networks" for details.

Set key value and reboot

```
cnodekv cnnumofveths 1
reboot
```

Set vlan_method to 0

```
echo 0 > /proc/sys/net/ipmc/vlan_method
```

Set mask for eth0 to ports 0, 2 and 4

```
echo 0x15 > /proc/sys/net/ipmc/fake_eth0/emask
```

Set mask for eth1 to ports 1, 3 and 5

```
echo 0x2a > /proc/sys/net/ipmc/fake_eth1/emask
```

Bring up eth0 and eth1

```
ifconfig eth0 192.168.43.1
ifconfig eth1 192.168.44.1
```

Assuming linux is loaded on XLR0, configure XLR0 gmac2 to network "A" subnet

```
ifconfig eth2 192.168.43.2
```

Configure XLR0 gmac3 to network "B" subnet

```
ifconfig eth3 192.168.44.2
echo 0x2a > /proc/sys/net/ipmc/fake_eth1/emask
```

The IPMC can now be pinged from both NICS.

```
ping –I eth2 192.168.43.1
ping –I eth3 192.168.44.1b
```

8.3.8 Front Mode

In this mode, the 10G ports are connected directly to the front panel 10G connectors.

8.3.9 RTM Mode

In this mode, the 10 G ports are connected directly to the RTM port.

8.4 Ethernet Ports on the RTM

There are twelve Ethernet ports on the Rear Transition Module (RTM), ten 1GbE ports and two 10G ports. The 10G ports on the RTM and front panel are jointly routed to either the front panel or RTM with the fswcmd command.

8.5 Fabric and Base Switch Management

The PP50’s base and fabric switches are isolated and can be considered "lightly managed." Generally, management and administration traffic flows over the base switch and data plane traffic flows over the fabric plane. The control plane can be on either switch, depending on the application.

8.6 CNode Base Switch (bswcmd) Command

Base Switch Command, provides base switch operation and information.

Note: You must bind bswcmd to the CNODE's IP before using it, example below.

The bswcmd command can run on either the IPMC or XLR (RMI Linux or WindRiver Linux) but it relies on a daemon called bswd which is runs on the IPMC (only the IPMC).

8.6.1 Binding bswcmd to the CNODE's IP

For an XLR to run bswcmd, a configuration file named bswcmd.cfg with the IPMC's (and bswd) IP address in it must be created in the command file's directory. For example, if the IPMC IP address is 10.4.1.10, put the following line into the config file

ip_address 10.4.1.10

The configuration file may also be created by using the bind command shown below.

```
root@localhost:/pp50-xlr-utils-v2.2.6r00/xlr-utils# ./bswcmd bind 172.17.3.147
Bound to destination 172.17.3.147 ipaddress
Attempting to route over eth0 ,eth2 and eth3....
```

8.6.2 bswcmd Usage Examples

Below are examples for using the bswcmd command.

8.6.2.1 Common bswcmd Commands

`bswcmd`

```
root@cnode-pp50:~ bswcmd
Specify Arguments
Use: bswcmd list - To view the list of supported commands
Use: bswcmd bind <valid ip address> before using bswcmd list command
```

`bswcmd list`

```
root@cnode-pp50:~ bswcmd list
 enable port  <port id> | <all>
 disable port <port id> | <all>
 - enable or disable the (tx and rx) function of ports (0 and 1)
 show link <port id> <all>
 - Shows the link admin state and link state
 show statistics <port id> | <all>
 - Displays variable statistics of the port(s)
 get-link-check
 - Writes the link state Into the Logfile /tmp/link_status
 show statistics <port id> | <all>
 - Displays variable statistics of the port(s)
 bind <ip address>
 - Binds bswcmd to an IPMC IP Address
```

bswcmd show link all

```
root@cnode-pp50:~
root@cnode-pp50:~ bswcmd show link all
--------------------------------------------------------------------
PORT ADMIN STATE LINK STATE SPEED(MBPS)         CONNECTION NAME
---- ----------- ---------- ---------------------------------------
0    ENABLED     UP         1000                IPMC  BASE CHANNEL A
1    ENABLED     UP         1000                IPMC  BASE CHANNEL B
2    ENABLED     UP         1000                XLR0  GMAC2
3    ENABLED     UP         1000                XLR0  GMAC3
4    ENABLED     UP         1000                XLR1  GMAC2
5    ENABLED     UP         1000                XLR1  GMAC3
6    ENABLED     DOWN       10                  NONE  UNUSED
7    ENABLED     DOWN       10                  NONE  UNUSED
```

`bswcmd show statistics all`

```
root@cnode-pp50:~ bswcmd show statistics all
================================================================================
Base PORT                  0      1      2      3      4      5      6      7
================================================================================
TxOctets               21423      0 292069  25091 292069  25091      0      0
TXDropPkts                 0      0      0      0      0      0      0      0
TxQoSPkts                215      0    215      0    215      0      0      0
TxBroadcastPkts            2      0   1512      2   1512      2      0      0
TxMulticastPkts            0      0   1071    195   1071    195      0      0
TxUnicastPkts            213      0    432      0    432      0      0      0
TxCollisions               0      0      0      0      0      0      0      0
TxSingleCollision          0      0      0      0      0      0      0      0
TxMultipleCollision        0      0      0      0      0      0      0      0
TxDeferredTransmit         0      0      0      0      0      0      0      0
TxLateCollision            0      0      0      0      0      0      0      0
TxExcessiveCollision       0      0      0      0      0      0      0      0
TxFrameInDisc?             0      0      0      0      0      0      0      0
TxPausePkts                0      0      0      0      0      0      0      0
TxQoSOctets            21423      0  21423      0  21423      0      0      0
RxOctets              270710  25091      0      0      0      0      0      0
RxUndersizePkts            0      0      0      0      0      0      0      0
RxPausePkts                0      0      0      0      0      0      0      0
Pkts64Octets            1470      0      0      0      0      0      0      0
Pkts65to127Octets        240    195      0      0      0      0      0      0
Pkts128to255Octets      1057      0      0      0      0      0      0      0
Pkts256to511Octets        23      2      0      0      0      0      0      0
Pkts512to1023Octets       11      0      0      0      0      0      0      0
Pkts1024to1522Octets       0      0      0      0      0      0      0      0
RxOversizePkts             0      0      0      0      0      0      0      0
RxJabbers                  0      0      0      0      0      0      0      0
RxAlignmentErrors          0      0      0      0      0      0      0      0
RxFCSErrors                0      0      0      0      0      0      0      0
RxGoodOctets          270710  25091      0      0      0      0      0      0
RxDropPkts                 0      0      0      0      0      0      0      0
RxUnicastPkts            219      0      0      0      0      0      0      0
RxMulticastPkts         1071    195      0      0      0      0      0      0
RxBroadcastPkts         1511      2      0      0      0      0      0      0
RxSAChanges             2371      2      0      0      0      0      0      0
```

```
RxFragments                 0      0      0      0      0      0      0      0
RxExcessSizeDisc            0      0      0      0      0      0      0      0
RxSymbolError               0      0      0      0      0      0      0      0
RXQOSPkt                    0      0      0      0      0      0      0      0
RXQOSOctets                 0      0      0      0      0      0      0      0
Pkts1523to2047              0      0      0      0      0      0      0      0
Pkts2048to4095              0      0      0      0      0      0      0      0
Pkts4096to8191              0      0      0      0      0      0      0      0
Pkts8192to9728              0      0      0      0      0      0      0      0
Pkts2048to4095              0      0      0      0      0      0      0      0
```

8.6.3 Fabric Switch

The fabric switch may be configured locally or remotely. See Chapter 8.2, "Fabric Switch Management" for more information on configuring the fabric switch.

8.7 Configuring XLR Network Interfaces using KV

The KV variable can be used to assign IP addresses to ethernet ports after Linux has booted up. Please note that Linux utilities should be installed to use this feature. The following table lists the KV variables used for this purpose.

Table 8-7: XLR Ethernet ports and their corresponding key values

Ethernet Interface	Key value	Description
XLR0:eth0	s0_ge_proto	static / dhcp
	s0_ge_ipaddr	IP address
	s0_ge_mask	IP Mask
XLR0:eth1	s0_ig_proto	static / dhcp
	s0_ig_ipaddr	IP address
	s0_ig_mask	IP Mask
XLR0:eth2	s0_bsa_proto	static / dhcp
	s0_bsa_ipaddr	IP address
	s0_bsa_mask	IP Mask
XLR0:eth3	s0_bsb_proto	static / dhcp
	s0_bsb_ipaddr	IP address
	s0_bsb_mask	IP Mask
XLR0:eth4	s0_xg0_proto	static / dhcp
	s0_xg0_ipaddr	IP address
	s0_xg0_mask	IP Mask
XLR0:eth5	s0_xg1_proto	static / dhcp
	s0_xg1_ipaddr	IP address
	s0_xg1_mask	IP Mask
	s0_gatewayip	Gateway
	s0_nameserver	Name Server

The KV variable for XLR1 will start with prefix **s1_***

8.7.1 Configuring XLR Network Interfaces Example

To have Linux configure eth0 of XLR0 into static mode automatically, set the following key-value items.

```
root# kv s0_ge_proto static
root# kv s0_ge_ipaddr 10.4.69.34
root# kv s0_ge_mask 255.255.0.0
root# kv s0_gateway 10.4.0.254
root# kv s0_nameserver 10.4.1.30
```

If you want Linux to configure eth2 of XLR0 into dhcp mode automatically, set the following key-value item.

```
root# kv s0_bsa_proto dhcp
```

To implement the key values set above simply reboot Linux.

9

Using Wind River Linux on the PP50

This chapter provides instructions on how to install and compile the optional (not required) Wind River Linux Platform for Network Equipment Limited Edition operating system (WR PNE-LE) in the following sections.

Note: For installing WR PNE-LE updates please see WindRiver's documentation.

9.1 Overview

Note: WindRiver may release additional patches after publication of this document. If a file listed here is not available from WindRiver, contact Continuous Computing customer service for compatibility guidance.

There are a few basic steps to installing and using WR PNE-LE on PP50s:

1. Get the source files, Section 9.1.2, "Installation Requirements"
2. Install it, Section 9.2.1, "Installation Steps for WindRiver PNE 2.0"
3. Set it up, Section 9.5, "Linux Setup"
4. Use it, Section 9.6, "Linux Command Line Options"

9.1.1 CCPU/WindRiver Release Compatibility

The board's BSP is WindRiver release specific. Use the table below for quick reference. As future releases are done this will serve a matrix.

Table 9-1: CCPU/WindRiver Release Compatibility

CCPU Release	WindRiver Required Files
PP50 V1.3upd3	• WindRiver PNE LE 2.0 (Three DVDs) • Update Pack 4 for Wind River Linux 2.0 (DVD-R128063.1-1-04.iso) • (WRL_2_0_4-layer-wrll-linux-2.6.21-20101201-spin1.zip)

9.1.2 Installation Requirements

This section describes the installation requirements.

9.1.2.1 For WindRiver PNE LE 2.0

WR-PNE version 2.0 installed on a development x86 server.

- The files listed below.

Figure 9-1: WindRiver PNE LE 2.0 Files for CCPU Release 1.3

File	Function	Source
DVD-R128063.1-1-04.iso	Update Pack 4 for Wind River Linux 2.0 Cumulative patches for Wind River Linux 2.0 - Replaces and Supersedes Service Packs 1-3	These files can be purchased from Wind River and downloaded from their support web site. Contact Wind River for details.
WRL_2_0_4-layer-wrll-linux-2.6.21-20101201-spin1.zip	Wind River Linux 2.0 UP 4 Cumulative patch for wrll-linux-2.6.21 Requires Wind River Linux 2.0 Update Pack 4 (2.0.4) to be installed.	

9.2 Installing the Template and Patch

This chapter provides instructions on how to install and compile the optional (not required) Wind River Linux Platform for Network Equipment Limited Edition operating system (WR PNE-LE) in the following sections.

Note: These instructions assume that WindRiver PNE is installed to /home/devel/WindRiver and the CCPU BSP package and file WRL_2_0_4-layer-wrll-linux-2.6.21-20101201-spin1.zip has been put into the /tmp folder.

9.2.1 Installation Steps for WindRiver PNE 2.0

1. Install WindRiver PNE 2.0.
2. Install service pack 4 for WindRiver PNE 2.0.
3. Install the patches.

```
cd /home/devel/WindRiver/updates
cp /tmp/WRL_2_0_4-layer-wrll-linux-2.6.21-20101201-spin1.zip ./
unzip WRL_2_0_4-layer-wrll-linux-2.6.21-20101201-spin1.zip
../maintenance/mtool/mtool_linux
```

4. Install PP50 support for PNE LE

```
cd /tmp
tar -xzf pp50-wr-linux-vx.x.xrxx.tar.gz
cd pp50-wr2.0-release
./bsp_install /home/devel/WindRiver
./package_install /home/devel/WindRiver
```

9.3 Building the Kernel and NFS

Follow these instructions to create the kernel and root system files.

1. Start WindRiver Work Bench

```
cd /home/devel/WindRiver
./startWorkbench.sh
```

2. Start a New Project

At Workbench GUI, select menu "File->New->Wind River Linux Platform Project" to create a new project.

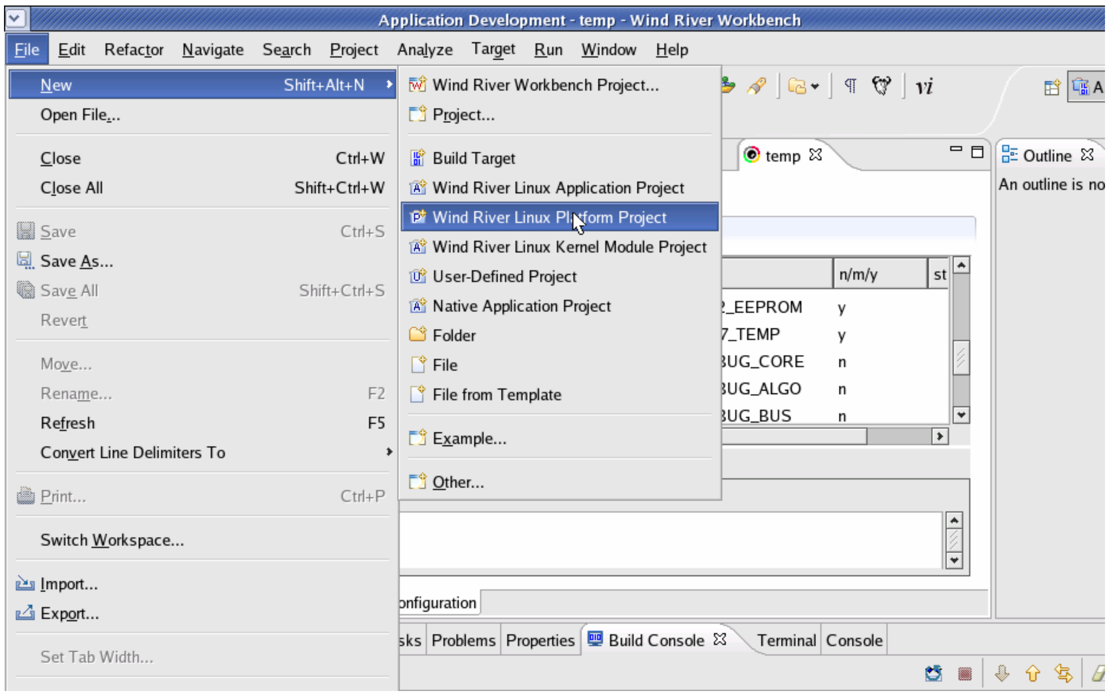
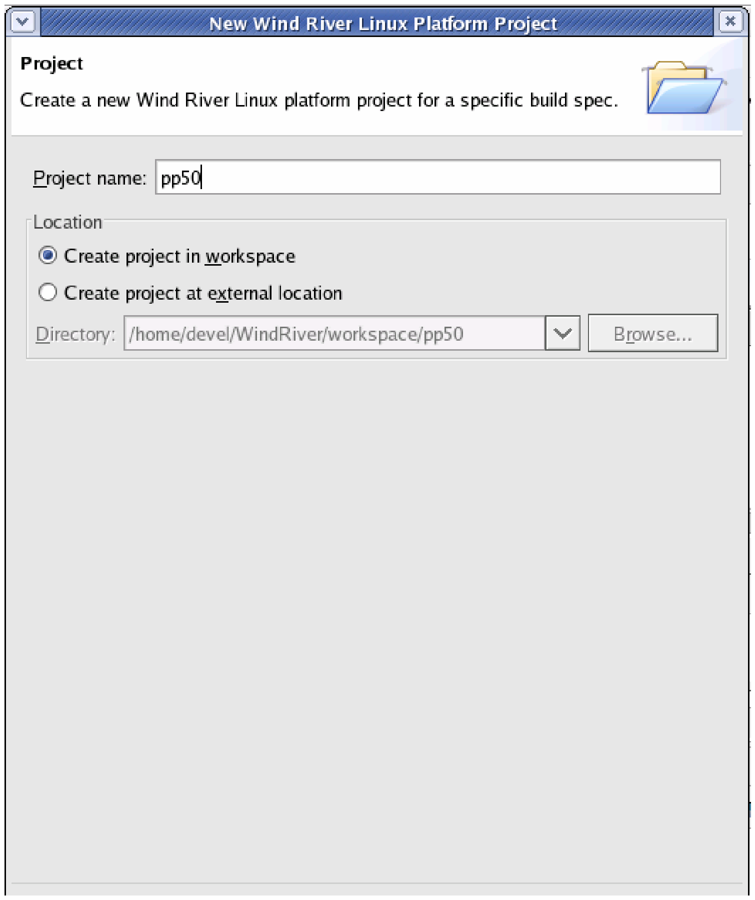


Figure 9-2: Create a New Project

At the Project window, input your Project name, then click Next.



Project

Create a new Wind River Linux platform project for a specific build spec.

Project name: pp50

Location

(●) Create project in workspace

( ) Create project at external location

Directory: /home/devel/WindRiver/workspace/pp50

Figure 9-3: Input the Name

At the Configure Options window select:

- Board: ccpu_xlr_pp50p2,

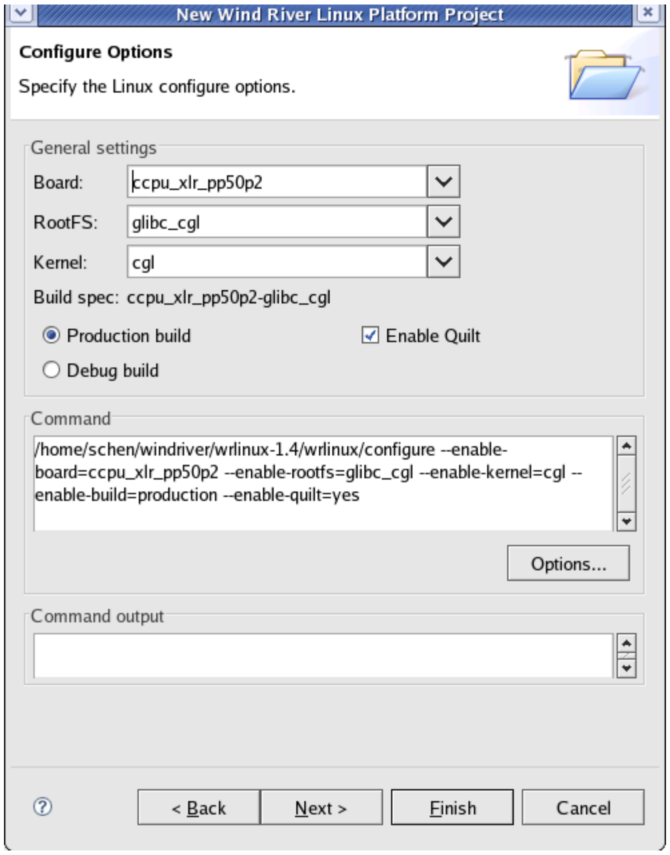
And one of the following pairs depending on whether you want a CGI or standard system and kernel:

- RootFS: glibc_cgi and Kernel: CGI

  or
- RootFS: glibc_std and Kernel: standard

and the default settings for the rest of the parameters.

Then click NEXT .



Board: ccpu_xlr_pp50p2

RootFS: glibc_cgl

Kernel: cgl

Build spec: ccpu_xlr_pp50p2-glibc_cgl

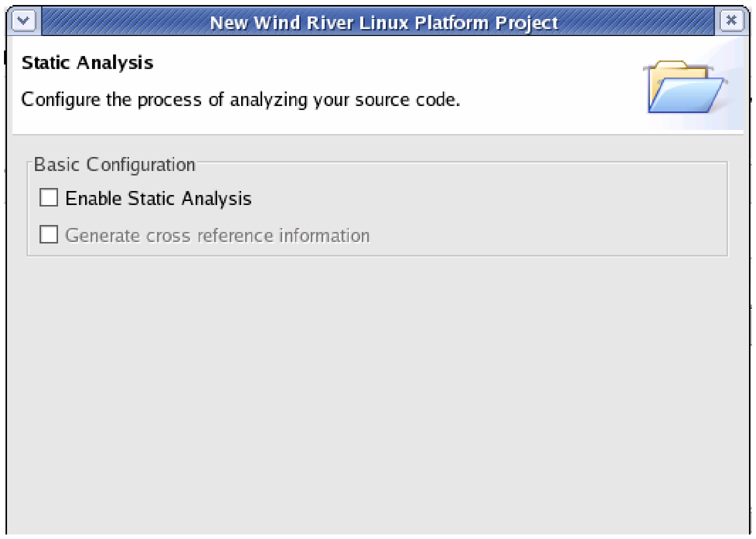
[✓ Production build] Debug build

[✓ Enable Quilt]

```
/home/schen/windriver/wrlinux-1.4/wrlinux/configure --enable-
board=ccpu_xlr_pp50p2 --enable-rootfs=glibc_cgl --enable-kernel=cgl --
enable-build=production --enable-quilt=yes
```

Figure 9-4: Select Board

At the Static Analysis window, click Finish button.



New Wind River Linux Platform Project

Static Analysis

Configure the process of analyzing your source code.

Basic Configuration

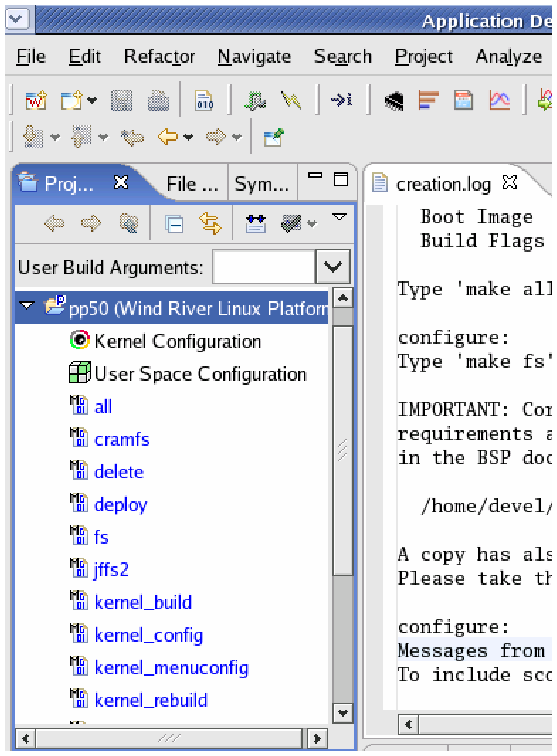
☐ Enable Static Analysis

☐ Generate cross reference information

Figure 9-5: Static Analysis

3. Configure Project Options

You will see the project name PP50 in the Project Tab.

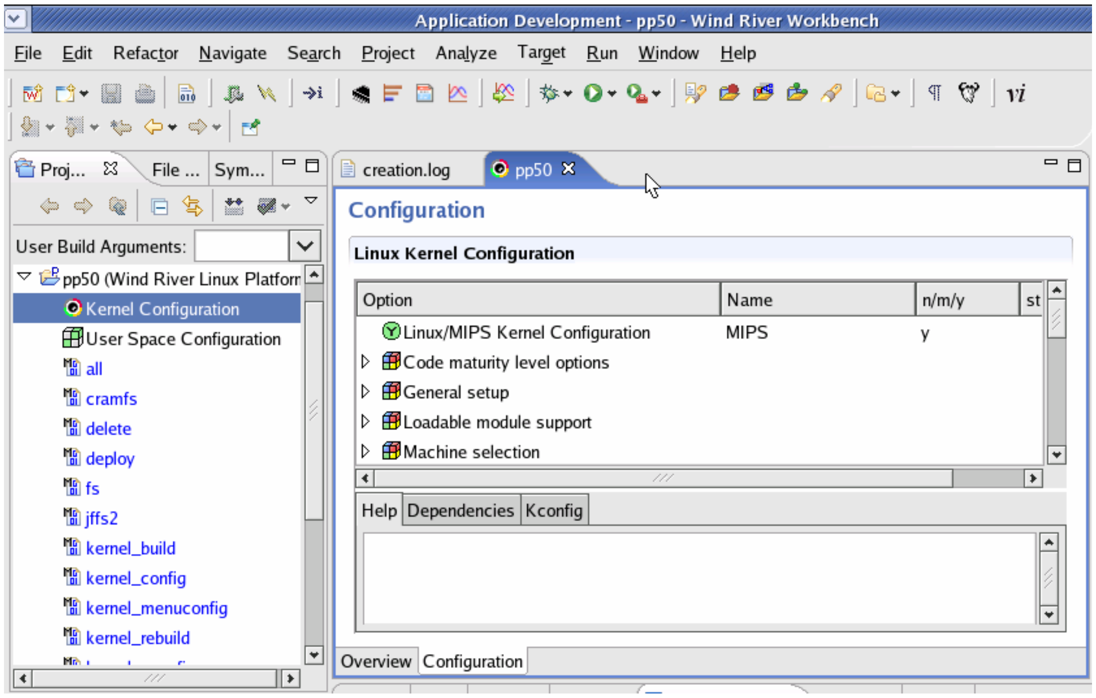


```
  Boot Image
  Build Flags

Type 'make all

configure:
Type 'make fs'

IMPORTANT: Cor
requirements a
in the BSP doc

  /home/devel/

A copy has als
Please take th

configure:
Messages from
To include scc
```

Figure 9-6: Project Name

Double click "Kernel Configuration" at PP50 project tab to unpack WindRiver linux kernel for the project.

The PP50 will compile with the default options for the kernel, but these can be modified on this screen to meet specific project requirements. .

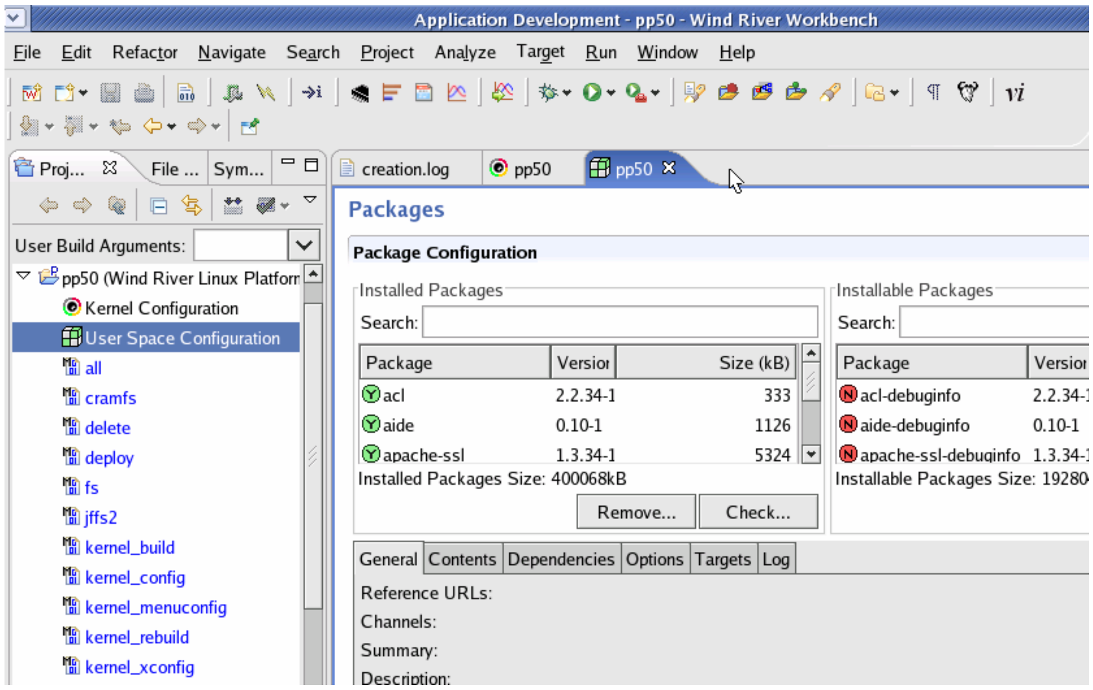


Option	Name	n/m/y	st
Linux/MIPS Kernel Configuration	MIPS	y	
Code maturity level options			
General setup			
Loadable module support			
Machine selection			

Figure 9-7: Linux Kernel Configuration

Double click "User Space Configuration" at PP50 project tab to set up your NFS package.

Default options will work for the PP50, but these can be modified on this screen to meet specific project requirements.



Installed Packages

Package	Versior	Size (kB)
acl	2.2.34-1	333
aide	0.10-1	1126
apache-ssl	1.3.34-1	5324

Installed Packages Size: 400068kB

Installable Packages

Package	Versior
acl-debuginfo	2.2.34-1
aide-debuginfo	0.10-1
apache-ssl-debuginfo	1.3.34-1

Installable Packages Size: 19280

Figure 9-8: Package Configuration

4. Build the Kernel

Note: It will probably take more than one hour to build the kernel.

Right click "kernel_rebuild" or "kernel_build" at PP50 Project Tab and select "Build_Target" to build WindRiver linux kernel.

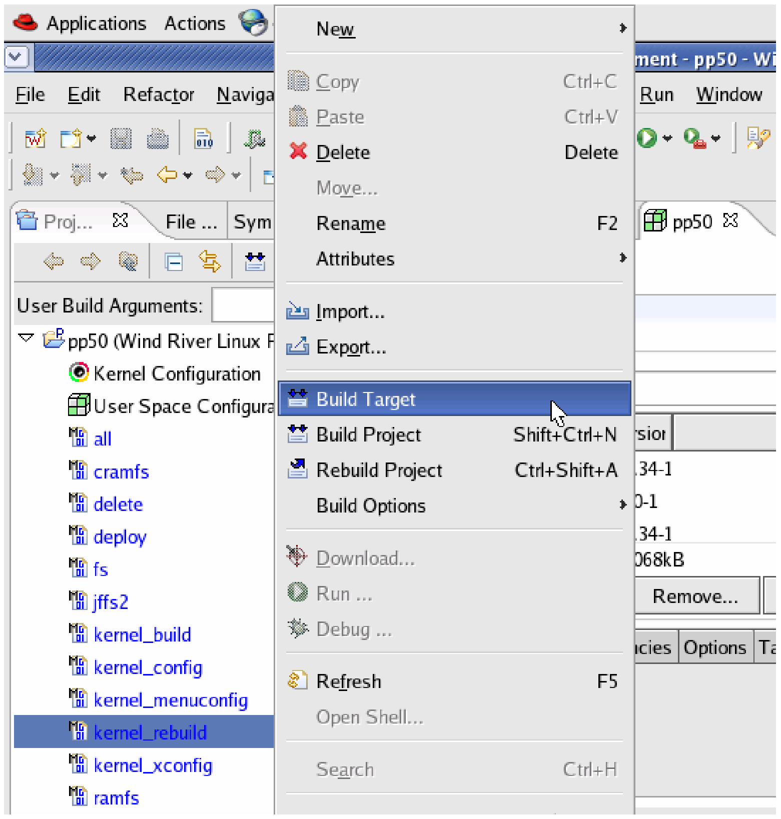


Figure 9-9: Build WindRiver Linux Kernel

5. Build the NFS File System.

Note: It will probably take more than 5 hours to build NFS File System.

Right click "fs" on the PP50 project tab and select "Build Target" to build the WindRiver linux NFS.

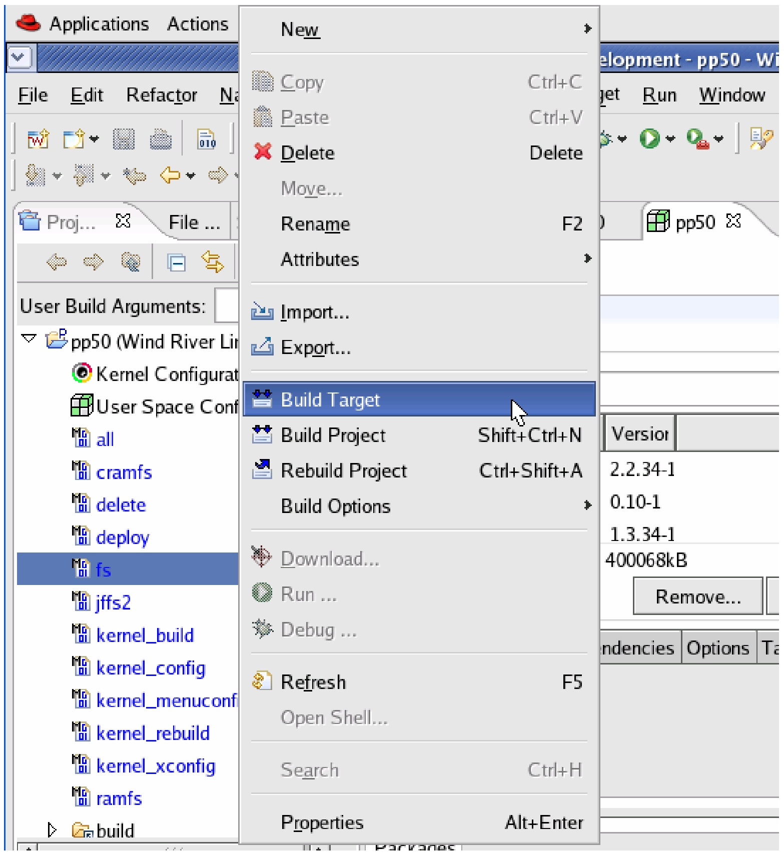


Figure 9-10: Build WindRiver Linux NFS

6. Examine the output files.

In the directory /home/devel/WindRiver/workspace/pp50_prj/export you should see two files: the linux kernel image and the and NFS tar file respectively named in WindRiver PNE 2.0:

- ccpu_xlr_pp50p2-vmlinux-stripped-WR2.0bl_standard
- ccpu_xlr_pp50p2-glibc_std-standard-dist.tar.bz2

Note: Filenames used by and distributed by Continuous Computing may be different from those of WindRiver. For example the WindRiver Linux Kernel Image used in Continuous Computing development is pp50-linux-kernel-wr-vx.x.x (x.x.x being version number) for convenience but the content is the same.

9.3.1 Installing the Boot Kernel and NFS

Note: This chapter provides instructions on how to install and compile the optional (not required) Wind River Linux Platform for Network Equipment Limited Edition operating system (WR PNE-LE) in the following sections.

Install the kernel image ccpu_xlr_pp50p2-vmlinux-stripped-WR2.0bl_standard from the previous section by copying them to the system's tftp directory:

```
cd /home/devel/WindRiver/workspace/pp50_prj/export
cp ccpu_xlr_pp50p2-vmlinux-stripped-WR2.0bl_standard/tftproot
```

Install the NFS File System ccpu_xlr_pp50p2-glibc_std-standard-dist.tar.bz2 from the previous section by making a directory for the file system on the target blade and untarring it there. This example uses: /home/devel/export/xlr_glibc_nfsroot/.

Install the NFS file system into the directory:

```
mkdir -p /home/devel/export/xlr_glibc_nfsroot/
cd /home/devel/export/xlr_glibc_nfsroot
tar -xjf /home/devel/WindRiver/workspace/pp50_prj/ccpu_xlr_pp50p2-glibc_std-
standard-dist.tar.bz2
```

9.3.2 Booting the Target Blade

This example uses following network configuration:

Table 9-2: Boot Target Blade Network Configuration

Linux Kernel Image Name	ccpu_xlr_pp50p2-vmlinux-stripped-WR2.0bl_standard (from previous section)
Linux Filesystem Name	ccpu_xlr_pp50p2-glibc_std-standard-dist.tar.bz2 (from previous section)
TFTP Server Path	10.4.69.69:/tftproot
Debug Server	10.4.69.69
Gateway	10.4.0.254
NFS Server	10.3.8.225
Target (PP50 Blade)	10.4.69.2

Connect to the serial console on the target PP50 blade and execute the following commands at the bootloader:

```
ifconfig -i gmac0 -a 10.4.69.2 -g 10.4.0.254
tftpc -s 10.4.69.69 -f ccpu_xlr_pp50p2-vmlinux-stripped-WR2.0bl_standard
elfload
userapp root=/dev/nfs nfsroot=10.3.8.225:/home/devel/export/
xlr_glibc_cgl_nfsroot ip=10.4.69.2:10.3.8.225:10.4.0.254:255.255.0.0::eth0:off
console=ttyS0,38400
```

The userapp command will start the kernel & pass in the parameters. The prototype for these parameters is:

```
userapp root=/dev/nfs nfsroot=serverip:/rootpath
ip=targetip:serverip:gateway:netmask::eth0:off console=ttyS0,38400
```

Once the blade has booted, log in as:

- username: root
- password: root

9.4 Memory Map Setup

To load applications in Linux, a physical address range needs to be reserved and excluded from the Linux memory map. The current release excludes these regions from the Linux Kernel memory.

Following are the default memory regions have been reserved in the current release

- 0x0c000000 to 0x10000000 for KSEG0 applications
- 0x20000000 to 0x40000000 for KUSEG applications.

However command line options are provided to change these memory regions. See the following sections.

9.5 Linux Setup

1. Boot Linux with "xlr_loader" option.

```
userapp xlr_loader
```

2. Once Linux boots up, create a character device with the command:

```
mknod /dev/xlr_app_loader c 245 0
mknod /dev/xlr_app_loader_1 c 245 1
```

3. Compile the applications provide by running "make all" command.

9.6 Linux Command Line Options

The following linux command line options are available.

Note: The following command options and text use the term “CPU” is used for legacy reasons, in most circles “thread” is a more term in this application.

9.6.1 linux_cpu_mask=<cpu_mask>

This defines the mask of CPUs in hex that run Linux. Any valid mask can be given here and Linux will run on those CPUs. The remaining CPUS can be used for RMIOS applications. The default Linux CPU mask is ffffffff

---

Note: Applications cannot be launched on a core that has Linux running on a few threads unless the "shared_core" option is passed during the kernel boot.

For example, linux_cpu_mask=0x3f, loader feature will be available only on 0xffffff00 CPUs.

9.6.2 kseg0_start=<address>

This defines the start of physical memory in KSEG0 region to use for loading KSEG0 apps. This address must be:

- Greater than _end
- Multiple of 2MB
- Less than 0x10000000

9.6.3 kseg0_size=<size>

This defines the size of KSEG0 region in hex (no 0x prefix). The user must ensure that enough memory has been reserved for Linux to run while configuring memory size for the loader.

Note: Currently if kseg0_start and kseg0_size value are changed below the default values mentioned above then loader may fail to launch any kseg applications.

9.6.4 kumem=<size@addr>

The fragment of physical memory that will be used for loading the KUSEG applications.

- addr represents the start address of the physical segment.
- size represents the size of physical segment.

The size and addr can be represented in kilobytes k/K, MegaBytes M/m, or Giga-Bytes g/G. The default unit of size and address is bytes.

Up to 4 fragments of memory can be specified for loading kuseg applications

- If one of the fragments is invalid, then the default size and address will be used, ignoring the other valid arguments
- All the contiguous/overlapping regions are merged into a single large region
- KUSEG start must be greater than 512MB and a multiple of 2MB.

9.6.4.1 Examples of Using kumen

```
userapp xlr_loader kumem=256M@3584M kumem=131072K@3968M kumem=128M@768M
kumem=128M@640M
```

Use print_physmap to get the valid memory from the bootloader prompt.

9.6.4.1.1 One GB Example

memory: 000c000000 @ 0000100000 (usable)

memory: 002f000000 @ 0020000000 (usable)

Leaving the lower 512 MB, the valid memory region is from 512MB to 1264MB for example, 752MB.

Example for allocating 512 MB of memory from two different locations:

```
$ userapp xlr_loader kumem=512M@1024M\
```

or as continuous block

```
$ userapp xlr_loader kumem=256M@512M kumem=256M@1024M
```

9.6.4.1.2 Two GB Example

memory: 000c000000 @ 0000100000 (usable)

memory: 006f000000 @ 0020000000 (usable)

Leaving the lower 512 MB, the valid memory region is from 512MB to 2288MB in other words 1776MB.

Example for allocating 1152 MB of memory as a continuous segment:

```
$ userapp xlr_loader kumem=1152M@1024M
```

Example for allocating 1152 MB of memory as a discrete segment:

```
$ userapp xlr_loader kumem=128M@512M kumem=1024M@1024M
```

9.6.4.1.3 Four GB Example

memory: 000c000000 @ 0000100000 (usable)

memory: 00a0000000 @ 0020000000 (usable)

memory: 0048000000 @ 00e0000000 (usable)

Leaving the lower 512 MB, the valid memory region is from 512MB to 3072MB (for example, 2560 MB and 3584 MB to 4736 MB (for example, 1152MB)).

example for allocating 3712MB of memory:

```
$ userapp xlr_loader kumem=2560M@512M kumem=1152M@3584M
```

9.6.5 kuseg_start_hi=<hi_address>

This defines the most significant word of the start of physical memory in memory to use for loading KUSEG0 apps. It is specified in Hex without the 0x prefix.

9.6.6 kuseg_start_lo=<lo_address>

This defines Least Significant word of the start of physical memory in memory to use for loading KUSEG0 apps and is specified in Hex without the 0x prefix.

The KUSEG size Start must be

- Greater than 512MB
- Multiple of 2MB
- Less than 4GB

9.6.7 kuseg_size_hi=<hi_size>

This defines Size of memory to be used for KUSEG apps (Most Significant word) and is specified in Hex without the 0x prefix.

9.6.8 kuseg_size_lo=<lo_size>

This defines the size of memory to be used for KUSEG apps (least Significant word) and is specified in Hex without the 0x prefix.

Note: Specifying only one of the values in the parameter pairs will result in default value being used. The Most significant word will be assumed 0 if not given in this case.

9.6.9 app_sh_mem_sz=<hex_size>

This option specifies the size of the shared memory between RMIOS and Linux user applications. The maximum supported size is 512MB. Shared memory is excluded from the specified KUSEG physical memory region. The default memory size is 2MB.

9.6.10 shared_core

Selecting this option will enable support for running Linux and RMIOS applications on the same core. Therefore Linux can run on 1 to 31 CPUs and RMIOS applications can be launched on the remaining CPUs.

For example, Linux can be brought up on 16 threads with the following options:

"userapp linux_cpu_mask=99999999"

and RMIOS applications can be launched on the remaining threads through 0x66666666.

Ensure that no Linux drivers will have access to FMN. So, the GMAC

XGMAC, SPI4, Security and usermac will not be operational if this option is selected and FMN will not be visible to the Linux threads.

Note: Coredumps through loader are not supported.

9.7 Linux Loader Applications

The Linux loader application runs on top of the Linux OS. It allows Linux to be run on threads and provides the userapp command. See Section 9.7.1, "userapp" for details about this command.

When this "loader" support is enabled, multiple instances of Linux can be run on a configurable number of threads (1 to 31) and various RMIOS applications can be loaded on the remaining threads. This framework supports shared memory between RMIOS applications and Linux user applications. The size of the shared memory is configurable through Linux boot time arguments.

The userapp command loads and unloads RMIOS programs from within Linux. The Linux instance running on core one allows the userapp command to load the RMIOS onto the other seven cores and to start.

Note: The Linux OS, bootloader RMIOS, and Linux loader application being run on a PP50 **must** all come from the same version of the SDK.

The following Linux Loader applications are available on the PP50.

9.7.1 userapp

The userapp command can be used with the following options:

9.7.1.1 load

```
./userapp load -f <file> -m <mask> [-h]
```

This option is used to load RMIOS applications. Both KSEG and KUSEG are supported.

The following command line options are supported for load:

```
-f <file> : To specify the ELF file to load
-m <bitmask> : Mask of CPUs to start
```

Note: Only one bit should be set in bitmasks for KSEG applications.

```
-b <buddy_cpu_mask>
```

Buddy CPU mask for KUSEG applications. The thread specified in buddy   mask are marked are busy and cannot be used for any other application until the master CPU exits

For KSEG applications, this has no effect. All the free CPUs will be assigned as a KSEG buddy. But, even if a few threads are running a KUSEG application then the whole core will not be assigned as a KSEG buddy.

```
-c <0|1>
```

To disable or enable common code segment

```
-h
```

Show help

```
-T virt_uart
```

Option to view the output of the applications on virtual uart console. By default all applications make use of UART1.

All the arguments are passed to the RMIOS application that is launched. Once a KSEG application is launched no other application can be cannot be launched until it is stopped.

9.7.1.2 stop

The "stop" command is used to stop (kill) a specified thread. This is possible only if the application has done the necessary setup for reload as mentioned in Section above. This Memory will be reclaimed once all the CPUs of the same set are back to the park mode. "set" is the set of all specified master and buddy CPUs used during launch.

```
./userapp stop -m <bitmask> : Mask of CPUs to stop
```

For example, if the application is launched using the command below,

```
./userapp load -m 0xff00 -f <file>,
```

To reclaim memory and launch any new application on any of these CPUs the user has to stop all CPUs - "0xff00". CPUs either can be stopped individually or all in a one shot by passing the correct bitmask. If any of the CPUs does not come back to park code (if interrupts are not enabled) then the memory will not be reclaimed and none of the CPUs of the set can be used to launch any new application.

9.7.1.3 status

This option displays the status of threads running, active and stopped along with the available memory.

```
./userapp status
```

9.7.1.4 showmem

This option displays the contents of the shared memory.

```
./userapp showmem -s <size(in words)> -o <offset(in words)>
```

9.7.1.5 shmem

This command reserves the specified memory from the kuseg region (physically above 512 MB). This can be used as shared memory among all RMIOS applications launched using the Linux loader. This command can be executed only once. The RMIOS Lib get_shared_mem_start() API can be used to access this memory.

```
./userapp shmem -s <size> -c -p -h
```

The following are the supported command line options.

- -s <size>: Memory size in hex.
- -c: If passed loader will try to allocate contiguous buffer This is valid only if <size> is <512 MB.
- -p: Print current reserved buffer.
- -h: Help.

9.8 Building an RMIOS application

9.8.1 Building KSEG0 applications

KSEG0 applications have to be built with load address that match the reserved area in Linux for this. Default region reserved for KSEG0 apps is 0x0c000000 to 0x10000000. However this can be changed with the Linux boot command arguments (see C above).

KUSEG applications don't require any change in the load address.

9.8.2 Stop and Re-load support

Any RMIOS application that needs to support "stop" and "reload" features needs to enable interrupts using standard "trap_init-init_irq-sti"

1. trap_init() : Sets up exception vectors and ebase.
2. init_irq() : Enables interrupts in eimr.
3. sti() : Enables global interrupt bit in status register.
4. int get_shared_mem_start(unsigned long *start, uint64_t *size); Provides an application the start (virtual address) and size of the shared memory between RMIOS and Linux applications. The API returns 0 on success and negative value on failure. It may fail if it does not find any empty table entry or enough virtual address space to map the shared physical memory.

Note: Some of the RMIOS apps in this release use core 0, thread 0 for processing. With Linux running on core 0, thread 0, the applications need to be modified to not use core 0, thread 0 to run with linux_loader.

10

Rear Transition Modules

This chapter describes the architecture and usage of PP50 Rear Transmission Modules, hereafter referred to as RTMs. An RTM plugs into the rear shelf slot behind the its PP50. The RTM and the PP50 are connected through a Zone-3 connector.

Two types of RTMs are available for PP50s:

- Standard RTM
- COP50 RTM

Both RTMs are described in their respective sections below.

10.1 Standard RTM

The standard RTM functions as a basic RTM. No bypass functionality is available.

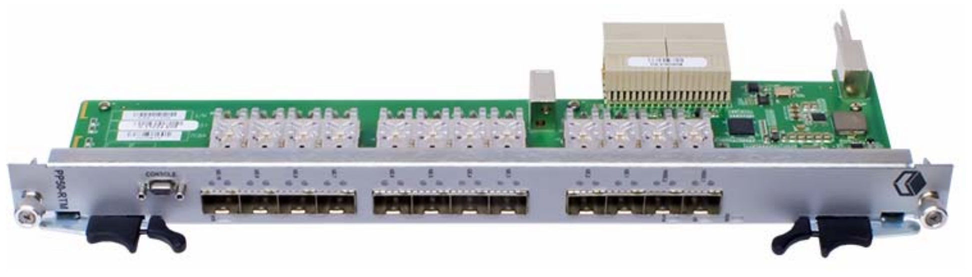


Figure 10-1: Standard RTM

10.1.1 Standard RTM Features

PP50 RTMs provide the following features:

● Ten GE 1000BaseT copper port

● Two standard 10GE SFP+ ports

10.1.2 Specifications and Features

- All AdvancedTCA components conform to the AdvancedTCA specification: PICMG3.0 R2.0
- The RTM-COP50 RTM is hot swappable.

10.1.2.1 General

- Ten 1000BaseT gigabit Ethernet ports over RJ45 terminating SerDes lanes from the front blade.
- Two 10GE SFP+ ports terminating XAUI lanes across their respective PHYs.

10.1.2.2 Mechanical

- The COP50 base board may be used as a single wide RTM in accordance with PICMG 3.0.
- Dual RJ45 connectors are magnetic free but contain LEDs.
- Contains a serial port with RS232 transceiver and microDB9 connector.
- RTM back panel has a metal shield covering RJ45 connectors, relay circuitry and secondary side of magnetics to minimize EMC/EMI interference.

10.1.2.3 Power

- The power supply supports hot swap.
- RTM contains a compliant ESD strip circuit.

10.1.2.4 Management

The management interface to the IPMC includes:

- A FRU EEPROM.
- Standard LEDs and a handle switch.
- FlexConsole serial port.
- MDIO connection to the 10GE PHY(s).
- Interrupt connection back to the IPMC for changes in SFP status.

10.2 COP50 RTM

The COP50 offers the functions of the standard RTM and additional bypass functionality. Using a combination of hardware bypass technology and a management processor, the COP50 monitors the DPI platform for failures. In normal operation, traffic passes into the RTM and through to the DPI processor. In the event of failure detection, including complete power outage, the product diverts traffic around the device, thereby avoiding network outages. With this bypass capability inside the ATCA system, external bypass solutions are not needed. The standard RTM offers no such capability. See the following sections for more details.

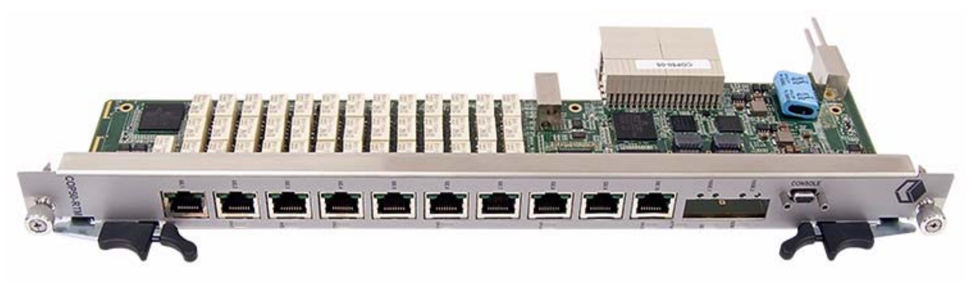


Figure 10-2: COP50 RTM

10.2.1 COP50 Features

PP50 RTMs provide the following features:

● Ten GE 1000BaseT copper port

● Two standard 10GE SFP+ ports

● Live and power loss bypass protection of individual pairs of copper ports (COP50).

10.2.2 Important COP50 Terms Definitions

Consistent usage of these terms to describe the configuration and the current operational state of the RTM's ports is important in any discussion of the COP50.

Port-Pair: A pair of adjacent ports (0, 1) (2, 3) (4, 5) (6, 7) and (8, 9) that have the capability to be connected together such that the external-facing ports are connected in a straight-through connection.

Bypass State: the state where a port-pair's external ports are connected together, preventing any packets from reaching the PP50.

Inline State: the state where a port-pair's ports are connected into the PP50, allowing processing of packets.

Direct Mode: A port-pair configuration where the ports are always in the Inline State and will never switch to Bypass State.

Flowthrough Mode: A port-pair configuration where the ports are always in the Bypass State and will never switch to Inline state.

Protected Mode: A port-pair configuration in which the ports will stay in the Inline State as long as heartbeats are received and power is present, but will otherwise automatically switch to Bypass State.

10.2.3 COP50 RTM Overview

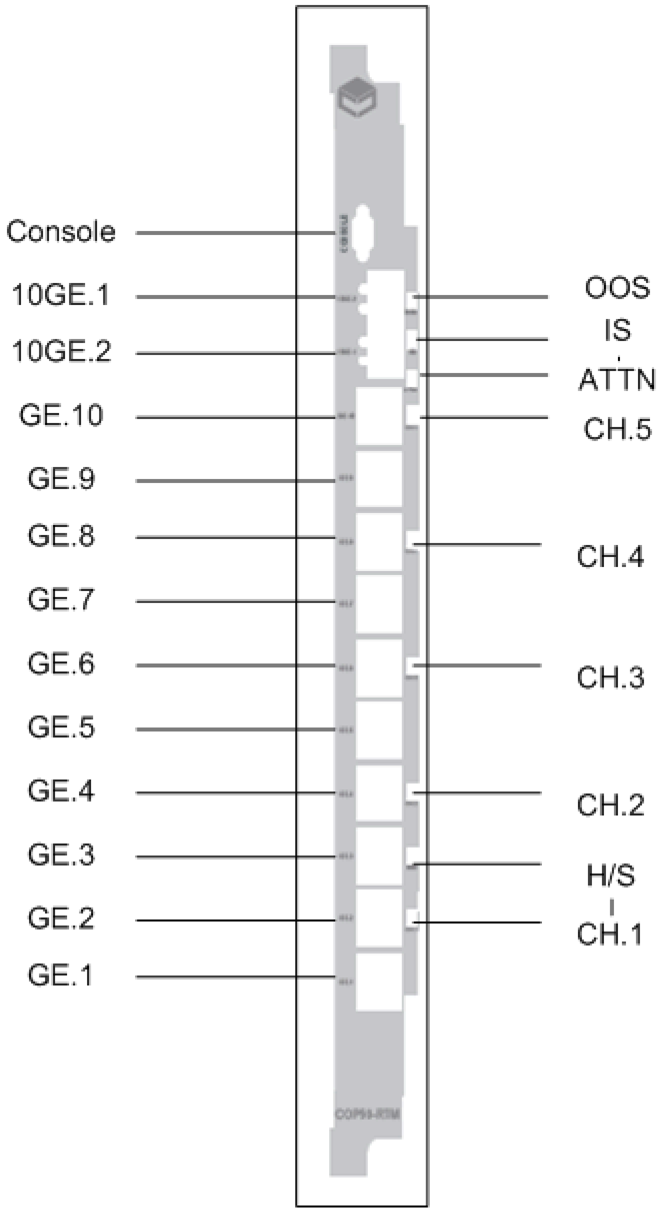


Figure 10-3: COP50 Front View

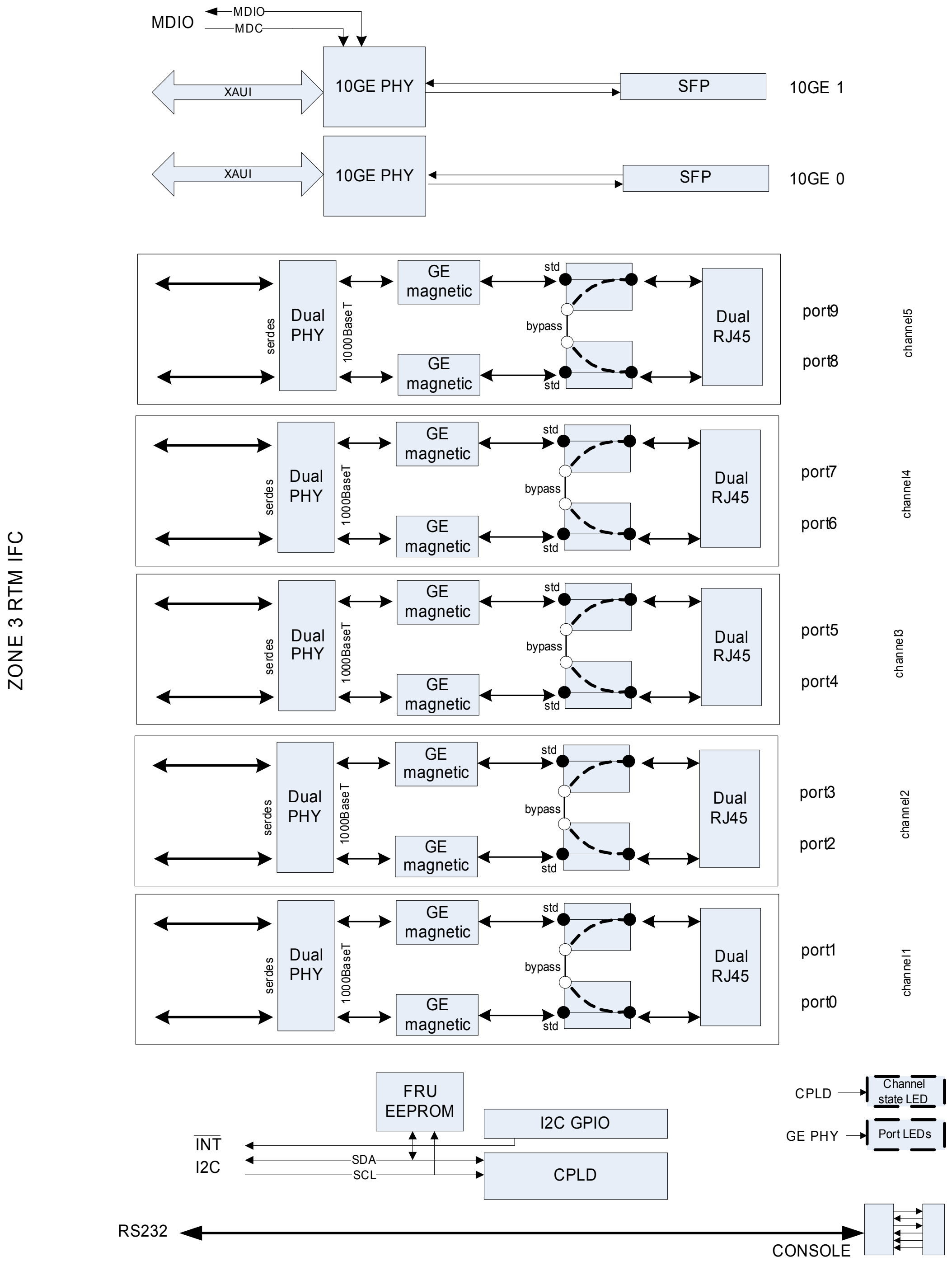


Figure 10-4: RTM-COP50 Block Diagram

The block diagram above presents 5 distinct pairs of copper GE ports creating a protected channel where one ingress GE port can be switched to its associated egress GE port in the event of a software or power failure. Relays are used to mechanically connect adjacent ports.

Both 10GE SFP+ ports operate in standard mode and do not receive any protection.

10.2.3.1 Bypass protection

Control of the bypass protection resides within the front blade IPMC complex. At bootup or by management command, software configures each port-pair to enable protection or not. During normal operation, a daemon running on the IPMC acts as a server to allow management software running somewhere else in the system (on the XLRs or an external blade) to kick the RTM CPLD watchdog at regular interval to confirm its sanity.

Upon failure of either watchdog timer or power, the CPLD initiates a protection switch on all port-pairs such provisioned. Relays are simply reset in the bypass position connecting ingress and egress copper port together as a line loopback.

10.2.4 COP50 Specifications and Features

- All AdvancedTCA components conform to the AdvancedTCA specification: PICMG3.0 R2.0
- The RTM-COP50 RTM is hot swappable.

10.2.4.1 General

- Ten 1000BaseT gigabit Ethernet ports over RJ45 terminating SerDes lanes from the front blade.
- Two 10GE SFP+ ports terminating XAUI lanes across their respective PHYs.
- Electrical bypass protection of individual 1000BaseT GE port-pairs [pair of GE ports].

10.2.4.2 Mechanical

- The COP50 base board may be used as a single wide RTM in accordance with PICMG 3.0.
- Dual RJ45 connectors are magnetic free but contain LEDs.
- Contains a serial port with RS232 transceiver and microDB9 connector.
- RTM back panel
- has a metal shield covering RJ45 connectors, relay circuitry and secondary side of magnetics to minimize EMC/EMI interference.

10.2.4.3 Power

- The power supply supports hot swap.

- Power supply includes a SuperCap capable of powering the necessary circuitry in the event of a power failure. It contains enough energy to address the worst case scenario over current and voltage drop over time.
- Power supply includes an aggregate power good signal fed to both front card and CPLD.
- Devices not essential to the bypass protection circuit are power by a distinct 3V3 rail. 10GE phy, SFP cages, and unrelated logic fit this definition.
- RTM contains a compliant ESD strip circuit.

10.2.4.4 Management

The management interface to the IPMC includes:

- A FRU EEPROM.
- Standard LEDs and a handle switch.
- FlexConsole serial port.
- CPLD registers including protection control.
- Additional GPIOs under i2c control.
- MDIO connection to the 10GE PHY(s).
- Interrupt connection back to the IPMC for changes in SFP status.

Board includes a single voltage rail/low power CPLD.

- Register-based timer part of the CPLD to set the watchdog period. Range is from 0.4 sec to 50.0 sec in 0.2sec increments (8-bit resolution).
- Powerup default value is 0 (watchdog inactive).
- When the watchdog timeout is set to 0, the CPLD will neither set nor reset any relay coils. (i.e., since the default timeout is 0, on powerup the CPLD will NOT modify the relay states until so commanded by the management software.
- CPLD has an i2c slave interface to the IPMC complex.
- CPLD provides individual protection of each port-pair. Locking registers select between protected and non-protected mode preventing erroneous software operation.
- CPLD triggers the bypass of the selected channels upon detection of loss of power or a missed software watchdog event.
- CPLD can be upgraded via software from the IPMC.
- CPLD uses its internal oscillator for all operation instead of relying on external circuitry.
- CPLD autonomously set/resets the channel relays during normal operation at a regular internal. (i.e., similar to DRAM refresh, the CPLD periodically ensures that the relays do in fact reflect the internal state).

CPLD displays the protection status of each channel through a dedicated LED:

- Dark – port-pair is in Direct mode.
- Green – port-pair is in Protected mode, Inline state.
- Red – port-pair is in Protected mode, Bypass state.

Note: The port-pair LEDs are only valid when the Blue Hot-Swap LED is OFF (for example when the RTM is powered). Any time the Blue Hot-Swap LED is on or blinking, the RTM power is either off or transitioning. The relays will maintain their last programmed mode (for Direct or Flowthrough ports) or will revert to Bypass state (for Protected ports). But the LEDs cannot reflect that state until the RTM is powered and cop50d is actively managing the RTM.

10.2.4.5 Bypass protection

- Bypass protection circuit resets individual relay coil consecutively to minimize current surge from the superCap upon detection of a failure.
- Bypass protection circuit resets all selected port within 250ms upon detection of a failure.

10.2.4.6 IPMC Firmware

- IPMC software enables/disables protection of each individual port-pair as part of the port configuration. The ability to elect protection on a given channel is software configurable, no dip switch, or mechanical header involved.
- When requested by external management software, IPMC software kicks the RTM watchdog by writing a strobe command to the CPLD.
- Board logic allows for individual port-pair control (5 distinct timers).
- IPMC softrt-pair modes, and sending watchdog kick event.

10.2.5 Installation and Usage

10.2.5.1 Initial Installation

When an RTM comes out of the shipping box, there is no way to know what state the relays are in. Connecting two incoming cables to a pair of ports that are bypassed could create network loops if those cables were intended to be direct connections without bypass protection. Because of this the following cases should be considered.

- All ports are being used as Protected port pairs. In this case, cables can be connected to the RTM at any time because an unexpected RTM configuration can’t create network loops. However, if minimum down time on each external connection is desired, it is still best to make sure the RTM is in a known (all ports bypassed) state before connecting them to the RTM.

- Some or all ports are being used as Direct connections without bypass protection. In this case, the RTM must be powered and properly configured under software control before attaching the external cables or else ports could be inadvertently connected.

10.2.5.2 PP50 IPMC Bootup and the COP50

This section describes the PP50 IPMC boot up as it relates to the COP50.

Note: The default Fabric Switch configuration is set for generic PP50 RTMs. To work with COP50s the VLAN configuration must be changed. See Section 8.2, "Fabric Switch Management" for instructions about configuring

1. fswd is booted, reads its configuration file, and applies its settings to the Fabric Switch.
2. If the KV variable “bypasscfg” exists, then the COP50 Control Daemon (cop50d) is started. If this variable does not exist, cop50d will not be started and there will be no way to control the port-pair state of the COP50 RTM.

   The KV variable “bypasscfg” controls how cop50d starts up. If bypasscfg contains "on" then the COP50 Control Daemon (cop50d) is started with no default configuration and will await a configuration command from external management via the API.

   If bypasscfg contains "MMMMM TIMEOUT" (mode configuration and timeout in milliseconds) then cop50d will be started with that initial configuration but using the default port for TCP/UDP communications.

   If bypasscfg contains "MMMMM TIMEOUT PORT" (mode, timeout in milliseconds, TCP/UDP port) then cop50d will be started with that initial configuration.

   If bypasscfg does not exist or has any format not matching the above examples, then cop50d will not be started and there will be no way to control the port-pair state of the COP50 RTM.
3. cop50d confirms the presence and compatibility of the COP50-RTM CPLD on the RTM I2C bus by reading the CPLD version register (syslog messages will be created if an unusable CPLD revision is found.).
4. cop50d attempts to read the initial configuration from KV variable “bypasscfg”. If the variable exists and is parsable, the specified states are configured immediately. If the variable is not correctly formatted or does not exist, no configuration action is taken.
5. cop50d will then listen for and act on UDP and TCP packets containing commands and/or heartbeat strobes, while periodically monitoring RTM presence.

10.2.5.3 RTM Insertion

When COP50 RTM Presence is detected via a successful read of the Version register in the CPLD, the cop50d daemon copies its internal mirror of the desired CPLD state into the CPLD and sets its internal RTM Present flag. The state mirror consists of the {Direct, Flowthrough, Protected} mode settings for each port and the watchdog timeout. Any ports configured for Direct or Flowthrough mode are immediately switched to the corresponding state (Inline or Bypass). Ports configured for Protected mode do not change state until an Arm command is received.

10.2.5.4 Upgrading the COP50 RTM CPLD

To upgrade the COP50's CPLD, run the jbi command in the CNode Linux CLI. The upgrade takes at least 9 minutes. This tool will erase, program, and verify the upgrade.

Note: Before running jbi to upgrade the COP50 RTM CPLD, run the "killall ipmcd" command to terminate the ipmcd daemon.

Caution: If you have any problems executing the command, run the command again. DO NOT turn the RTM off unless running the command fails on several attempts.

Two variations of the command may be used:

a) jbi -aPROGRAM -ddo_real_time_isp=1 /etc/cpld/cop50-cpld.jbc

or

b) jbi -aPROGRAM /etc/cpld/cop50-cpld.jbc

We suggest you use the first command, the Altera PDF real-time ISP allows you to

Note: After successfully upgrading the COP50 RTM CPLD, run "reboot" to restart CNode.

program a MAX II device while the device is still in operation. The software only replaces the software when the device is power cycled (powering down and back up again). This feature enables you to perform in-field updates to the MAX II device at any time without affecting the operation of the whole system.

10.2.5.5 RTM Removal

When the RTM is removed, the cop50d daemon detects its absence by three consecutive NAK'd I2C transactions to the RTM CPLD. It clears its internal RTM Present flag indicating the RTM is not present and will respond to watchdog strobes with that information if so requested. The daemon continues to run and poll for RTM insertion. When the CPLD is again available, the daemon will proceed as in RTM Insertion above.

Note: During a graceful shutdown, no particular action is taken when RTM shutdown request is received. This case is treated the same as when an RTM is removed without a request.

10.2.5.6 Auto-Arm versus Managed Re-Arming

This API supports two modes of recovering from a watchdog timeout.

Some system designers may prefer failfast operation, where once a port misses enough strobe heartbeats that it goes to bypass state, it can only be put back into direct state by a purposeful action from the management system. Even if heartbeats start flowing again, the port-pair will not automatically resume direct state. For this type of operation, use the "Strobe" command to strobe the watchdogs. Then have some other management thread periodically use the Query Request command to verify that all desired ports are still in Direct state. If not, this thread will use the Arm Channel(s) command to rearm the port-pairs after appropriate action has been taken to ensure the packet processing threads are running and are prepared to send Strobe commands again.

Others may prefer that a port-pair automatically resume direct state as soon as the heartbeats resume flowing. To support this method, simply use the Arm Channel command in place of the Strobe command to strobe the watchdogs. The Arm command resets the watchdog on the specified channel(s) and also forces state to direct mode. This style works well with using the bypasscfg KV variable to start up the bypass control daemon with a desired configuration; then no separate management entity is needed.

10.2.5.7 Software Specifications

10.2.5.7.1 KV variable format

The bypasscfg KV variable is formatted as follows:

```
MMMMM TIMEOUT PORT
```

where each M represents one port pair and is "P" for protected mode, "F" for flow through, and "D" for direct mode. PORT is the UDP and TCP port used by cop50d for commands and watchdog strobe requests. TIMEOUT is the CPLD timeout value in milliseconds.

Any value of timeout less than the resolution of the CPLD (0.2seconds) will be treated as a value of 200msec. Other values will be rounded to the nearest 200msec increment. A value of timeout greater than the maximum CPLD count (50.0 seconds) will be treated as 50.0 seconds.

After reading and parsing the bypasscfg variable, the cop50d emits a syslog message indicating the parsed values it is using for MMMMM, PORT, and TIMEOUT.

If bypasscfg is not found in KV, the UDP port defaults to 9725 and the cop50 daemon starts in an unconfigured state where the CPLD will not be sent any commands.

10.2.5.7.2 State Model

The cop50d daemon's internal state model consists of:

Figure 10-5: cop50d daemon's Internal State Model

State	Value	Description
valid	1 bit	indicates a valid config has been set via KV or network
mmmmm	5 elements	indicates the direct/flowthrough/protected mode for each port pair
tttt	16 bits	stores the watchdog timeout value in msec

The valid bit is set if a valid bypasscfg variable is found at startup, or any time a valid Configure UDP/TCP message is received.

Until the valid bit is set, the cop50d daemon will not configure the RTM CPLD's registers. When this is the case, the CPLD will not switch the relays in either direction.

Any time the RTM transitions from nonpresent to present, the cop50d checks the internal model's valid bit, and if valid, copies the internal state into the CPLD.

10.2.5.7.3 Network Transport

COP50D accepts commands over both UDP and TCP connections. All commands and responses are text-based so that netcat, telnet, or python can easily be used to communicate with the daemon.

In the case of UDP transport, each incoming UDP packet is assumed to contain exactly one command. The command is passed to the command parser for handling, and the response message (if any) is returned as a single UDP packet to the originating IP address/port.

In the case of TCP transport, data is read from the socket until a newline is received. At that point the command is passed to the parser for handling. The response message, if any, is sent back over the socket and the socket is left open awaiting further commands. All response messages are a single line of text ending with a newline except for the "?" command which returns complete CLI usage.

It is recommended that UDP transport be used for Watchdog Strobe commands so that the loss of one strobe won't incur possible delays from TCP stream retry timers, possibly backing up subsequent heartbeats.

UDP or TCP transport may be used for configuration commands, though it's usually easier to use TCP where delivery is assured and the response comes back synchronously on the socket than to use UDP and have to implement your own retry mechanism and response timeout.

10.2.5.7.4 Configuration message format

```
c MMMMM TIMEOUT
```

'c' is a literal 'c' for the configure command

MMMMM is a list of port configurations, 'D' for direct, 'F' for flowthrough, and 'P' for protected. Port-pairs are listed in numerical order (0, 1, 2, 3, 4) so this command will extend easily to future boards with higher port-pair counts.

Note that configuring a port for Protected mode does NOT automatically switch it to inline state. You must also Arm the port to make the state change.

TIMEOUT is the port timeout in milliseconds

cop50d confirms receipt of the configuration message by replying with:

OK - Settings applied to COP50 CPLD

DEFER - Settings saved, will be applied when RTM is present

ERROR message - An error occurred (such as invalid arguments)

A valid configuration command will always succeed even if the RTM is not currently present; the "DEFER" message will be returned and the daemon will cache the requested state and apply it to the RTM when present.

10.2.5.7.5 Strobe Watchdog(s) request

Note: Don't strobe the watchdog at intervals greater than 150ms. This will let the COP50 consume many CPU resources. Three to six strobes per timeout slice is enough.

Strobing a channel resets the watchdog timer for that channel to the currently-configured timeout value. The strobe command does not have any direct effect on the channel's state. That is, if a protected port's watchdog has expired and the port is in Bypass state, simply strobing the watchdog will not reset the port to Inline. (Compare with the "Arm" command.)

s CCCCC

's' is a literal 's' for the strobe command

CCCCC is a field of flags indicating whether to strobe each port. 1 indicates strobe, 0 indicates to skip that port. Port-pairs are listed in numerical order 0 though 4. CCCCC may also be replaced with "all" to strobe all ports configured for Protected mode.

Unless otherwise configured, COP50D will respond with one of the following

OK - Settings applied to COP50 CPLD

UNAVAIL - RTM is not present/powered, command had no effect

ERROR message - An error occurred (such as invalid arguments)

COP50D may be configured whether to respond or not to heartbeat requests over the UDP channel. COP50D will always send a response to TCP requests.

10.2.5.7.6 Arm Port-Pair(s) request

Arming a Protected port-pair resets the watchdog timer for that port-pair **and** switches the port states to Inline. If a port is found to have expired and switched to bypass state, this command is used to re-enable it for inline use.

a AAAAA

'a' is a literal 'a' for the arm command

AAAAA is a field of flags for whether to arm each port. 1 indicates arm, 0 indicates to skip that port. Port-pairs are listed in numerical order 0 through 4. AAAAA may also be replaced with "all" to arm all ports configured for Protected mode.

Unless otherwise configured, COP50D will respond with one of the following

OK - Settings applied to COP50 CPLD

UNAVAIL - RTM is not present/powered, command had no effect

ERROR message - An error occurred (such as invalid arguments)

COP50D may be configured whether to respond or not to arm requests over UDP. COP50D will always send a response to TCP requests.

10.2.5.7.7 Query Request

To query the current configuration and state of the daemon and CPLD, send 'q'. COP50D will respond with:

MMMMM SSSSS TIMEOUT

MMMMM = Channel mode for each channel in order from 0 though 4

-- = Configuration not valid (no config command received yet)

P = Protected mode

D = Direct mode

F = Flowthrough mode

SSSSS = Channel state for each channel 0 through 4:

B = bypass state

I = Inline state

-- = RTM unavailable/unpowered

TIMEOUT = configured timeout in milliseconds

10.2.5.7.8 Echo UDP Strobe/Arm commands

E selects whether UDP commands will cause a UDP reply packet or not. 1 = send a response. 0 = no response. Note that if 'echo' is turned off, the query command isn't useful over UDP. Default is to NOT respond over UDP.

e E

E = 1 (send response to UDP commands);

0 for silent (no response to UDP commands)

10.2.5.8 COP50 Usage Example

1. Ensure IPMC has firmware that includes cop50d functionality.
2. Log in to IPMC as root.
3. Type "cnodekv bypasscfg on" to enable cop50d on next reboot. Type "cop50d" to start the daemon now.
4. Type "telnet localhost 9725" to connect to the daemon
5. Type "c PPPFD 20000" to set three port-pairs to Protected mode, one to Flowthrough and one to Direct.

6. Arm the ports by typing "a all"
7. Check the RTM LEDs (within 20 seconds) to see proper indications.
8. Every 10 seconds or so, type "s all" to strobe the watchdogs and keep the ports in Inline state.
9. Check the status with "q"
10. Do not send any arm commands for more than 20 seconds. You can then confirm port-pairs 0-2 are in Bypass state by cross-checking LED state, "q" command output, and link state from fswd for the RTM 1G ports.
11. Use "Control-] <enter> e <enter>" to exit IPMC telnet.

Note: you can also use telnet from any other networked PC by connecting to port 9725 on the PP50 IPMC's IP address.

11

Firmware Upgrades

This chapter illustrates how to upgrade the PP50's firmware. Your command line input and output may vary depending on variables such as software and hardware versions and network environment.

11.1 CPLD Upgrade

Note: After version v2.3.2b02, users do not need to upgrade the XLR/LED CPLD manually. The system will upgrade them automatically. When the IPMC starts, it will check the CPLD release version with the key value of CPLD version, if they do not match, the CPLD will be upgraded automatically.

CPLD firmware can be upgraded using a Linux command line utility run from the IPMC 405 processor. The XLR0, XLR1, and the LED CPLD all can be programmed using this utility.

Note: The JTAG CPLD cannot be upgraded through software. It only can be upgraded using a Xilinx cable.

To upgrade a CPLD:

1. Login to the IPMC PPC405 Linux Shell. The default login is root user with no password (blank).

2. Download the CPLD file to the directory

3. Run cpldupgrade

```
cpldupgrade <type> <file>
```

where:

- type = 0 for XLR0 CPLD
- type = 1 for XLR1 CPLD
- type = 2 for LED CPLD
- <*file*> stands for the CPLD firmware in xsvf format

11.1.1 CPLD Upgrade Examples

Use the examples below for reference.

```
root@cnode-pp50:~ cpldupgrade  0 razacpld_test.xsvf
Starting CPLD programming...
CPLD number is 0
XSVF Player v5.01, Xilinx, Inc.
XSVF file = razacpld_test.xsvf
SUCCESS - Completed XSVF execution.
Execution Time = 2.310 seconds
Please reset system after the upgrade is finished, to make new CPLD take effect.
```

Another example of the command only

Upgrading the CPLD on both XLRs

```
cpldupgrade 0 pp50-xlr-cpld-v0x08.xsvf
cpldupgrade 1 pp50-xlr-cpld-v0x08.xsvf
```

Upgrading the LED CPLD

```
cpldupgrade 2 pp50-p2r2-led-cpld-v0x04.xsvf
```

11.2 XLR bootloader Upgrade

This section describes how to upgrade the XLR0 and XLR1 bootloaders.

11.2.1 Get Image File

11.2.1.1 Upgrade Boot Flash Via Network

1. Assume the new bootloader image file (flash.bin) is located at tftp server 10.4.69.69:/tftpboot/.
2. Connect both XLRs' gmac0 to the network via a cable before XLR bootup, then boot the XLR and run the command below on the bootloader's prompt.

```
Set IP address for gmac0
```

3. Run command "ifconfig -i gmac0 -a 10.4.69.11 -g 10.4.0.254 -n 255.255.255.0." The outputs will be as follows.

```
PP50-0 $ ifconfig -i gmac0 -a 10.4.69.11 -g 10.4.0.254 -n 255.255.255.0
ipaddr: 10.4.69.11
gateway: 10.4.0.254
netmask: 255.255.255.0
PP50-0 $ Starting Network interface "gmac0"
```

11.2.1.2 Get Bootloader Image File from TFTP Server

Run command "tftpc -s 10.4.69.69 -f flash.bin". The output will be as follows.

```
PP50-0 $ tftpc -s 10.4.69.69 -f flash.bin
Downloading [flash.bin].
Server IP : 10.4.69.69
tftpc stall, check network setup
Bytes downloaded: 786432
tftpc: download done. size = 786432 @ address 0x8c396530
PP50-0 $
```

11.2.2 Loading Image Files

The PP50 offers two methods for upgrading XLR firmware.

- Ping-Pong Upgrade Method
- Factory Golden Upgrade Method

Both ensure the system remains operable. The choice is one of customer convenience and custom.

Note: The XLR always copies the bootloader it is running to flash, so there is no problem with upgrading the current active bank.

With the ping-pong method, the inactive bank is upgraded. That way, the active bank contains the proven revision (N), and the new version (N.1) stays on the opposite bank until proven operable.

If revision N.1 doesn't work after it's loaded, reset to version N on the other bank to restore system operation. See Section 11.2.2.1, "Ping-Pong Upgrade Method" for details.

In the factory golden strategy, new firmware is loaded into bank A and the original firmware is left in bank B. Thus, bank A gets the firmware with new features, but the original firmware is still in ank B.

If the upgrade of bank A is unsuccessful, boot off bank B and use that to reload Bank A with a firmware image that is known to be working. See Section 11.2.2.2, "Factory Golden Upgrade Method" for details.

11.2.2.1 Ping-Pong Upgrade Method

1. Use `bk_update` to write the new image N.1 into the inactive flash bank. Output will be as follows.

```
PP50-0 $ bk_update
Begin to update boot flash(cs3), iobase: 0xb8000000.
Writing flash.bin address: 0x8c396530 Size: 917504 crc 0x1228
Erasing 0xb8000000...
Erasing 0xb8020000...
Copying from 0x8c476530 to 0xb80e0000...
Done.
Verifying...Done.
PP50-0 $
```

2. At the xlr bootloader prompt, run the "rollboot" command to boot from the opposite bank.

3. If the new boot fails, use the IPMC debug command to switch to original bank.

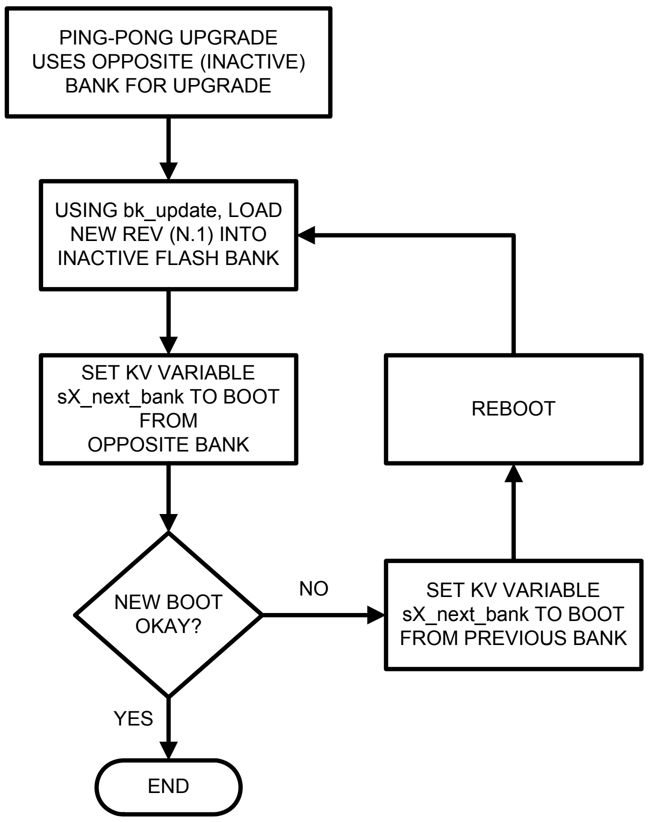

PING-PONG UPGRADE USES OPPOSITE (INACTIVE) BANK FOR UPGRADE
USING bk_update, LOAD NEW REV (N.1) INTO INACTIVE FLASH BANK
SET KV VARIABLE sX_next_bank TO BOOT FROM OPPOSITE BANK
NEW BOOT OKAY?
NO
YES
END
SET KV VARIABLE sX_next_bank TO BOOT FROM PREVIOUS BANK
REBOOT

Figure 11-1: Ping-Pong Upgrade Flow Diagram

For details regarding kv keys for upgrading flash banks see Section 7.4, "Key Value (KV) Database" , specifically the kv key sX_next_bank (X: 0 or 1) .

11.2.2.2 Factory Golden Upgrade Method

1. Use boot_update to overwrite the image in the active flash bank A. Output will be as follows.

```
PP50-0 $ boot_update
Begin to update boot flash(cs0), iobase: 0xbc000000.
Writing flash.bin address: 0x8c396530 Size: 917504 crc 0x1228
Erasing 0xbc000000...
Erasing 0xbc020000...
  Copying from 0x8c476530 to 0xbc0e0000...
  Done.
  Verifying...Done.
  PP50-0 $
```

2. Reboot without changing boot banks. Output will be as follows.

```
PP50-0 $ reboot
----------------------------------------------------------------
  System will be rebooted in about 1 seconds...
  Compiled @ 0x0000000046FBA3AF seconds from epoch
  Power On reset config = 0x00000000005854EF
================================================================
  Continuous Computing
  Bootloader 1.3 [Version: pp50-xlr-v2.1.0b00-rc1] for XLR732 on PP50-P2 Board
  (type h for help)
================================================================
  PP50-0 $
```

3. If the upgrade fails, use the KV boot bank variable to boot from the Factory Golden image, Bank B.
4. Once booted from Bank B, use `bk_update` to write a correctly working image into the primary flash bank. Output will be as follows.

```
PP50-0 $ bk_update
Begin to update boot flash(cs3), iobase: 0xb8000000.
Writing flash.bin address: 0x8c396530 Size: 917504 crc 0x1228
Erasing 0xb8000000...
Erasing 0xb8020000...
Copying from 0x8c476530 to 0xb80e0000...
Done.
Verifying...Done.
PP50-0 $
```

5. Change the KV back and boot from the now-good image in Bank A.

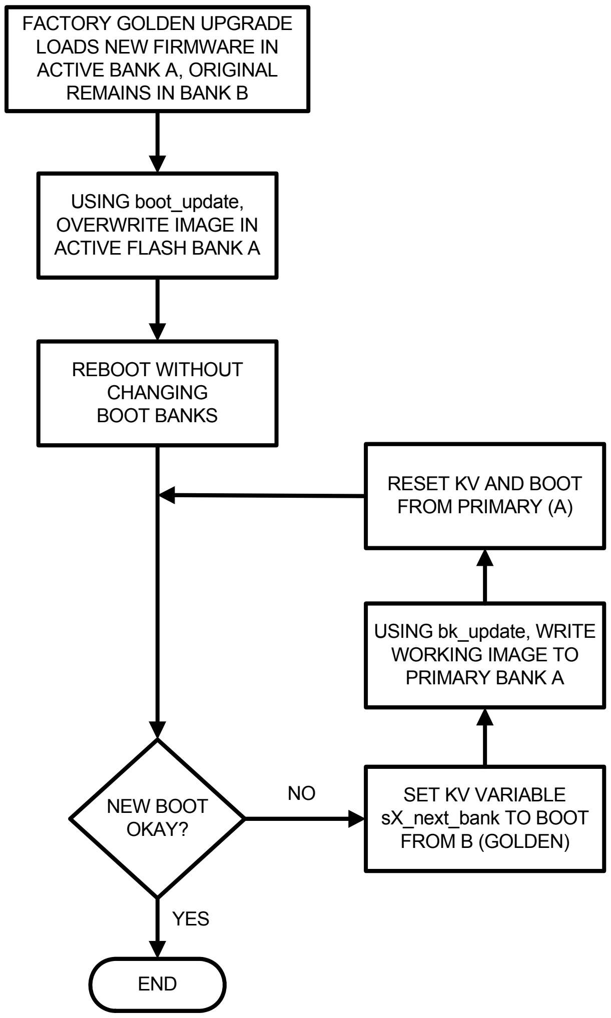

FACTORY GOLDEN UPGRADE LOADS NEW FIRMWARE IN ACTIVE BANK A, ORIGINAL REMAINS IN BANK B
USING boot_update, OVERWRITE IMAGE IN ACTIVE FLASH BANK A
REBOOT WITHOUT CHANGING BOOT BANKS
RESET KV AND BOOT FROM PRIMARY (A)
USING bk_update, WRITE WORKING IMAGE TO PRIMARY BANK A
NEW BOOT OKAY?
NO
SET KV VARIABLE sX_next_bank TO BOOT FROM B (GOLDEN)
YES
END

Figure 11-2: Factory Golden Upgrade Flow Diagram

For details regarding kv keys for upgrading flash banks see Section 7.4, "Key Value (KV) Database" , specifically the kv key sX_next_bank (X: 0 or 1) .

11.3 Upgrading the PP50 IPMC

Note: Make sure you are connected to the serial console port from the PP50.

Upgrade the IPMC based on current version.

- Section 11.3.1, "Upgrading Versions 2.3.x or Later to a Higher Version" which provides remote upgrade and u-boot ECC functions.
- Section 11.3.2, "Upgrading Versions 2.2.x or Earlier to a Higher Version".

11.3.1 Upgrading Versions 2.3.x or Later to a Higher Version

Assuming you need to upgrade from v2.3.0b00 to v2.3.0b01, follow the instructions below.

1. Save the non-default fabric switch configuration if there is one.

```
root@cnode-pp50:~ cnodekv fswitchCfg
```

   The key "fswitchCfg" keep the value for the config file, please check if there is non-default config.

   By default, the config file is /etc/fswitchCfg.def

```
root@cnode-pp50:~ cat /etc/fswitchCfg.def
```

   If there is any non-default config, please copy the config to local PC and reserve it for later usage.

2. Check if the network is not accessible, check and/or configure the interfaces. For example, to configure eth0.4094

   a. To configure the base channel A eth0:

```
root@cnode-pp50:~ ifconfig eth0 <IP_ADDRESS> netmask <NETMASK>
root@cnode-pp50:~ route add default gw <GATEWAYIP>
```

   b. Or to configure the base channel B eth0.4094:

```
root@cnode-pp50:~ ifconfig eth0.4094 <IP_ADDRESS> netmask <NETMASK>
root@cnode-pp50:~ route add default gw <GATEWAYIP>
```

Note: In order to keep the IP address after upgrade, please configure the IP_ADDRESS/NETMASK/GATEWAYIP to key-value database.

3. Download the Firmware and update the Flash

```
root@cnode-pp50:~ fwup -f pp50-ipmc-v2.3.0b01/pp50-ipmc-v2.3.0b01.tgz -s
10.3.7.204
```

Or

```
root@cnode-pp50:~ fwup -f http://10.3.7.204/pp50-ipmc-v2.3.0b01/pp50-ipmc-
v2.3.0b01.tgz
```

Or

```
root@cnode-pp50:~ fwup -f ftp://10.3.7.204/pp50-ipmc-v2.3.0b01/pp50-ipmc-
v2.3.0b01.tgz
```

Note: The file should be already put in the right server and directory

4. Activate the new release

```
root@cnode-pp50:~ rollboot
```

Then, the IPMC will reboot to the new release.

5. If there is non-default fabric switch config, restore the file

```
root@cnode-pp50-nboot:~ cnodekv fswitchCfg
```

Then, update the file denoted by the key "fswitchCfg", by default, it's /etc/fswitchCfg.def

Make sure the file is the same as that before upgrade.

```
root@cnode-pp50-nboot:~ vi /etc/fswitchCfg.def
```

Re-configure the fabric switch

```
root@cnode-pp50-nboot:~ fswitch reload config
```

11.3.2 Upgrading Versions 2.2.x or Earlier to a Higher Version

1. Pre-upgrade: before upgrading, please follow these steps:
   a. Save non-default fabric switch config if necessary

```
root@cnode-pp50:~ cnodekv fswitchCfg
```

The key "fswitchCfg" keeps the value for the config file, please check if there is non-default config.

By default, the config file is /etc/fswitchCfg.def

```
root@cnode-pp50:~ cat /etc/fswitchCfg.def
```

If there is any non-default config, please copy the config to local PC and reserve it for later usage.

   b. Configure IP address information to key-value database

```
 root@cnode-pp50:~ cnodekv ipaddr 10.4.50.34
 root@cnode-pp50:~ cnodekv netmask 255.255.0.0
 root@cnode-pp50:~ cnodekv gatewayip 10.4.0.254
 root@cnode-pp50:~ cnodekv serverip 10.3.7.204
```

c. Copy the two images to TFTP server,

   » tftpboot/pp50-ipmc-v2.3.0b00 / pp50-ipmc-netboot-v2.3.0b00.ui

   » tftpboot/pp50-ipmc-v2.3.0b00/pp50-ipmc-v2.3.0b00.tgz

d. Reboot IPMC and stop at u-boot

```
root@cnode-pp50:~ reboot
```

press any key to stop the autoboot

2. Upgrade : download the images and update the flash

   a. Configure network

```
 => run netup addram
```

   b. Check network access in u-boot

```
 => ping 10.3.7.204
```

If the server ip is alive, the PP50 IPMC is using Base Channel A.

While Base Channel A is used, the IPMC is using eth0 in Linux.

eth0 will use dhcp by default. If you want to use a static IP for eth0, run this command:

```
=> kv cnbsa_proto static
```

Then continue to step c);

If the server ip is not alive but the network connection works well, the PP50 IPMC is using Base Channel B. Run the following command to change the bswitch configuration:

```
 bswitch cfg flood
```

While the PP50 IPMC is using the Base Channel B, the IPMC is using eth0.4094 in Linux. Set this interface to be DHCP or static.

The command to set DHCP:

```
 => kv cnbsb_proto dhcp
```

The commands to set static an IP address:

```
=> kv ipaddr_b 10.4.50.34
=> kv netmask_b 255.255.0.0
=> kv cnbsb_proto static
```

   c. Download the netboot image and boot up:

```
=> tftp 1000000 pp50-ipmc-v2.3.0b00/pp50-ipmc-netboot-v2.3.0b00.ui; bootm
```

   d. Check network access in Linux.

   Login to PP50 nboot by user 'root' and check the IP address of interface eth0 and eth0.4094:

```
root@cnode-pp50-nboot:~ ifconfig
```

If neither eth0 nor eth0.4094 is assigned a valid IP address, set static IP address for the interface.

If the IPMC is using Base Channel A, configure eth0:

```
root@cnode-pp50-nboot:~ ifconfig eth0 10.4.50.34 netmask 255.255.0.0
root@cnode-pp50-nboot:~ route add default gw 10.4.0.254
```

If IPMC is using Base Channel B, configure eth0.4094:

```
root@cnode-pp50-nboot:~ ifconfig eth0.4094 10.4.50.34 netmask 255.255.0.0
root@cnode-pp50-nboot:~ route add default gw 10.4.0.254
```

e. Download the firmware and update the Flash

```
root@cnode-pp50-nboot:~ fwup -f pp50-ipmc-v2.3.0b00/pp50-ipmc-v2.3.0b00.tgz
-s 10.3.7.204
```

The firmware can be put on a HTTP or FTP server.

```
root@cnode-pp50:~ fwup -f http://10.3.7.204/pp50-ipmc-v2.3.0b00/pp50-ipmc-
v2.3.0b00.tgz
```

Or

```
root@cnode-pp50:~ fwup -f ftp://10.3.7.204/pp50-ipmc-v2.3.0b00/pp50-ipmc-
v2.3.0b00.tgz
```

Note: The Firmware will be updated to two Flash bank automatically, and system will reboot and run the new release

3. Post-upgrade, if there is non-default fabric switch config:

   a. Restore the file

```
 root@cnode-pp50-nboot:~ cnodekv fswitchCfg
```

Then, update the file denoted by the key "fswitchCfg",
by default, it's /etc/fswitchCfg.def.

Make sure the file is the same as it was before the upgrade.

```
root@cnode-pp50-nboot:~ vi /etc/fswitchCfg.def
```

   b. Reconfigure the fabric switch

```
root@cnode-pp50-nboot:~ fswitch reload config
```

11.3.3 Showing, Switching, and Rebooting Boot Banks

Login to IPMC Linux command line then use "showboot" to show boot bank information.

```
root@cnode-pp50:~ showboot
System was booted from bank 1.
The active bank version is: v2.4.0r00
The backup bank version is: v2.3.4b01
```

Use the "rollboot" command to change boot bank selection, for example:

```
    root@cnode-pp50:~ rollboot
    INFO: check U-Boot on /dev/mtdblock6 success
    INFO: check FPGA on /dev/mtdblock7 success
    INFO: check kernel on /dev/mtdblock8 success
    INFO: check rootfs on /dev/mtdblock9 success

    INFO: +++ system will reboot to bank 0 +++
```

Use "reboot" command to reboot system in the current bank

11.4 Linux Bootloader Upgrade Tool

Use this tool to upgrade the Linux XLR bootloader.

11.4.1 In WR Linux

Below is example of using the WR Linux upgrade tool.

```
root@10:/root> upgrade -V
upgrade version 1.2
root@10:/root> upgrade
Usage: upgrade <-a | -s> [options]
Options:
  -?                Display this usage
  -V                Display version of this program
  -a                Use active flash for operation
  -s                Use backup flash for operation
  -b <backup file>  Backup flash info to a file
  -p <program file> Program file to flash
  -v <program file> Verify flash info with a file
  for example
        For bakckup: upgrade -a -b bootloader.bck
        For program: upgrade -s -p bootloader.bin
        For verify:  upgrade -s -v bootloader.bin
root@10:/root> upgrade -a -b bootloader.bck
Backup flash physical address 0x1c000000 size 0x200000 to file bootloader.bck
... success
root@10:/root> upgrade -s -b bootloader.bcks
Backup flash physical address 0x18000000 size 0x200000 to file bootloader.bcks
... success
root@10:/root> upgrade -s -p bootloader.bin
Erase flash physical address 0x18000000 size 0x120000
Program flash physical address 0x18000000 size 0x120000 with file
bootloader.bin
Verify flash physical address 0x18000000 size 0x120000
Program flash successfully
root@10:/root> upgrade -a -p bootloader.bin
Erase flash physical address 0x1c000000 size 0x120000
Program flash physical address 0x1c000000 size 0x120000 with file
bootloader.bin
Verify flash physical address 0x1c000000 size 0x120000
Program flash successfully
root@10:/root> upgrade -a -v bootloader.bin
Verify flash physical address 0x1c000000 size 0x120000 with file bootloader.bin
... success
root@10:/root> upgrade -s -v bootloader.bin
Verify flash physical address 0x18000000 size 0x120000 with file bootloader.bin
... success
root@10:/root> upgrade -s -v bootloader.bin
root@10:/root> upgrade -s -p ../bootloader.bin
Erase flash physical address 0x18000000 size 0x120000
Program flash physical address 0x18000000 size 0x120000 with file
../bootloader.bin
Verify flash physical address 0x18000000 size 0x120000
Program flash successfully
```

11.4.2 In RMI Linux

Below is example of using the RMI Linux upgrade tool.

```
[root@XLR-732 luogr]$ upgrade -?
Usage: upgrade <-a | -s> [options]
Options:
  -?                Display this usage
  -V                Display version of this program
  -a                Use active flash for operation
  -s                Use backup flash for operation
  -b <backup file>  Backup flash info to a file
  -p <program file> Program file to flash
  -v <program file> Verify flash info with a file
  for example
        For bakckup: upgrade -a -b bootloader.bck
        For program: upgrade -s -p bootloader.bin
        For verify:  upgrade -s -v bootloader.bin
[root@XLR-732 luogr]$ upgrade -V
upgrade version 1.2
[root@XLR-732 luogr]$ upgrade -a -b bootloader.bck
Backup flash physical address 0x1c000000 size 0x200000 to file bootloader.bck
... success
[root@XLR-732 luogr]$ upgrade -s -b bootloader.bcks
Backup flash physical address 0x18000000 size 0x200000 to file bootloader.bcks
... success
[root@XLR-732 luogr]$ upgrade -s -p bootloader.bin
Erase flash physical address 0x18000000 size 0x120000
Program flash physical address 0x18000000 size 0x120000 with file
bootloader.bin
Verify flash physical address 0x18000000 size 0x120000
Program flash successfully
[root@XLR-732 luogr]$ upgrade -a -p bootloader.bin
Erase flash physical address 0x1c000000 size 0x120000
Program flash physical address 0x1c000000 size 0x120000 with file
bootloader.bin
Verify flash physical address 0x1c000000 size 0x120000
Program flash successfully
[root@XLR-732 luogr]$ upgrade -s -v bootloader.bin
Verify flash physical address 0x18000000 size 0x120000 with file bootloader.bin
... success
[root@XLR-732 luogr]$ upgrade -a -v bootloader.bin
Verify flash physical address 0x1c000000 size 0x120000 with file bootloader.bin
... success
[root@XLR-732 luogr]$ upgrade -v bootloader.bin
Please use option <-a | -s> to select the operation flash
[root@XLR-732 luogr]$
```

11.5 XLR Fabric Switch Configuration Utility, Installation

To configure a PP50's Fabric Switch on an XLR:

1. Copy the utility 'fswcmd' and config file 'fswcmd.cfg' to the directory of WR Linux or RMI Linux is in.
2. Update the 'fswcmd_cfg' with the IPMC IP address info. Note there is a readme inside the file.
3. Ensure the IPMC IP address is alive by pinging it from WR or RMI Linux.

Note: The 'fswcmd' utility for XLRs can be used on XLRs only; the one incorporated into the IPMC can be used for the IPMC ONLY.

Note: The 'fswcmd' is compatible with the fabric switch management daemon 'fswd' running in on the IPMC on the condition that the IPMC version is equal to or greater than v2.2.0b00.

Note: The 'fswcmd' running on the XLR has the same function as the one in IPMC Linux.

12

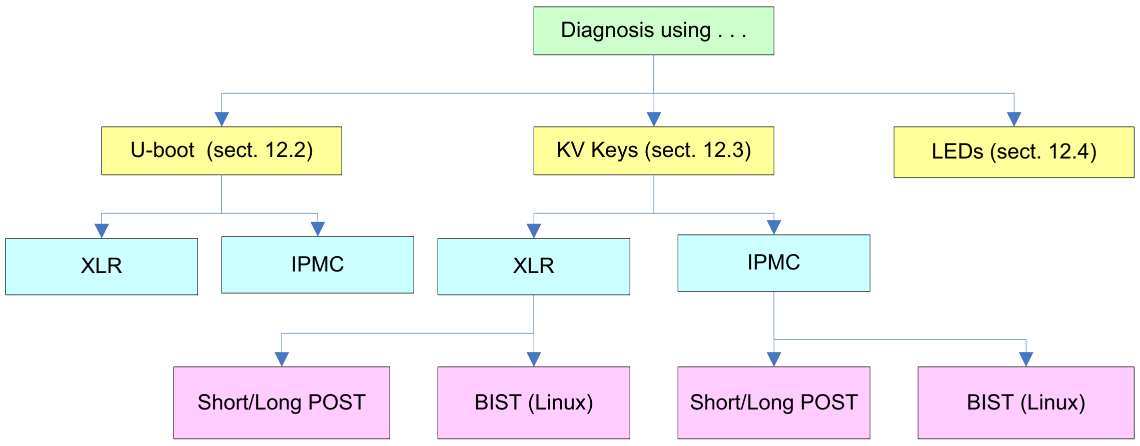
Diagnostics and Troubleshooting

Use this chapter to diagnose and troubleshoot PP50s.

12.1 Overview

The PP50 offers two methods (raw CLI and kv keys) for executing three types of tests (short POST, long POST, and BIST) as shown in the figure below.

Figure 12-1: Diagnostic Tests Tree



Please note the following constraints when running these tests:

- The XLRs BIST function is only supported in RMI Linux with RAM FS, not in WR Linux.

- During POSTs, never reset, power off or power cycle the board. Doing so may corrupt the firmware.
- The IPMC and Payload BISTs cannot be run at the same time.

Note: Reboot the IPMC after an IPMC BIST test.
Reboot the XLR after an XLR BIST test.

12.2 Running Diagnostic Tests from Raw CLI

Use the instructions in this section to run diagnostic tests from the IPMC PPC405's u-boot and payload XLRs.

12.2.1 IPMC Raw CLI Diagnostic Commands

1. At IPMC u-boot prompt, type the command diag to view the available test.

```
=> diag
```

Available hardware tests:

Table 12-1: IPMC Raw CLI Diagnostic (Hardware) Tests

Test	Test Description	Duration
i2c	- I2C test	instant
rtc	- RTC test	1m
memory	- Memory test	40-60s
shortmem	- Short Memory test	instant
nand	- NAND test	20-30s
atc210	- ATC210 test	instant
bcm5389	- BCM5389 test	instant
fswitch	- Fabric switch test	1s
fpga	- FPGA test	instant
frusel	- FRUSEL test	1s
hwaddr	- HWADDR test	instant
ne1617	- NE1617 test	instant
pmc8380	- PMC8380 test	1s
rtm	- RTM test	1s
tcam	- TCAM test	1s

Use 'diag [<test1> [<test2>...]]' to get more info.

Use 'diag run [<test1> [<test2>...]]' to run tests.

2. Enter the test option to get a description about a specific test.

diag [<test1> [<test2>...]]:

For example:

```
=> diag i2c
i2c - I2C test
```

This test verifies the I2C operation.

3. Use the run option to run a specified test.

diag run [<test1> [<test2> ...]]:

For Example:

```
  => diag run i2c
  POST i2c PASSED
```

4. Use "diag run" to run all the test items

```
diag run:
```

Some items need the fpga function, so you need to "run netup" before "diag run"

After all the items have finished, the test result summary will be listed as follows:

```
  => diag run
  POST i2c PASSED
  POST rtc Get RTC s since 1.1.1970: 23338344.
  POST bcm5389 PASSED
  POST fm2112 PASSED
  POST fpga
  FPGA version :0x8f
  Board version:0x01
  FPGA Magic   :0x7e
  PASSED
  POST frusel PASSED
  POST hwaddr
  HW address 0x48, logic slot 0x8
  PASSED
  POST ne1617 PASSED
  POST pmc8380 PASSED
  POST rtm PASSED
```

12.2.2 XLR Raw CLI Diagnostic Commands

1. At the XLR bootloader prompt, type the diag command to view the available tests.

```
PP50-0 $ diag
```

The available hardware tests are listed below.

Table 12-2: XLR Raw CLI Diagnostic (Hardware) Tests

Test	Test Description	Duration
gphy0	- bcm5482 gmac0 test	instant
gphy1	- bcm5482 gmac1 test	instant
gphy2	- bcm5482 gmac2 test	instant
gphy3	- bcm5482 gmac3 test	instant
xgphy0	- vsc7280 xgmac0 test	instant
xgphy1	- vsc7280 xgmac1 test	instant
cpld	- cpld test	1s
memshort	- short memory test	2s
flashlog	- part flash test	5-10s
flashall	- full flash test	20-25m
memlong	- long memory test	4-5 hours
psram	- psram test	45-75s
pcmcia	- pcmcia test	1-2s
tcam	- tcam register test	varies
pft	- pseudo fault test	varies
sipl	- uart 1 sipl channel test	1s

Use 'diag [<test1> [<test2>...]]' to get more info.

Use 'diag run' to run all test items.

Use 'diag run [<test1> [<test2>...]]' to run specified test item.

Refer to IPMC diagnostic command examples for usage of related test options.

12.3 Running Diagnostic Tests using KV Settings

This section describes how to run diagnostic tests using a combination of KV keys. The following table describes the KV keys used for diagnostics.

Table 12-3: POST/BIST KV Keys

Component	Boot Mode KV Key	Test Mask KV key
CNode	cn_bootmode	cn_test_mask
XLR0	s0_bootmode	s0_test_mask
XLR1	s1_bootmode	s1_test_mask

Generically these are referred to as xx_bootmode and xx_test_mask where xx can be cn, s0, or s1 for CNode, XLR0 and XLR1 respectively.

The xx_bootmode keys may be assigned the values shown below.

Table 12-4: xx_bootmode Settings (xx: cn, s0, s1)

Setting/Value	Description
normal	normal boot up, only short POST items will run according to xx_test_mask set
post_only	short/long POST items will run according to xx_test_mask set
bist_only	short/bist items will run according to xx_test_mask set
post_bist	short/long/bist items will run according to xx_test_mask set

Note: The short POST runs in all modes, but all items are controlled by the test mask key xx_test_mask. If the test mask key is absent, it will be created with default values to enable all short POST items to be run automatically while booting.

Use the xx_test_mask to map diagnostic items in detail as described below.

The xx_test_mask is a mask of 32 characters which are divided into 3 parts:

- Short POST (character 0 ~ 7)
- Long POST (character 8 ~ 23)
- BIST (character 24 ~ 31)

For example:

set key s0_test_mask as “1100xxxx000010xxxxxxxxxxxxxxxxxx”

where:

- 0 disables the test
- 1 enables the test
- x means the test is invalid in this context

Table 12-5: Diagnostic types and test mask string assignment

	Test Number																															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Post Type	Short Post Items								Long Post																BIST							
Normal, Default	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																								
post_only	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦								
bist_only	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩																	🟨	🟨	🟨	🟨	🟨	🟨	🟨	🟨
post_bist	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟨	🟨	🟨	🟨	🟨	🟨	🟨	🟨

☐ Blank cell indicates test is not run.

Note: Short Post Items are always run, even when the boot mode is not set.

12.3.1 Running IPMC Diagnostic tests with KV settings

12.3.1.1 IPMC U-boot command for short/long POST tests

Refer to the commands below to run related short/long POST items which are masked by test mask key string. It is similar to the XLR kv_diag command example.

```
=> help kv_diag

kv_diag [ -l | --list   ]  list bootmode and POST test items by kv "cn_test_mask"
and "cn_bootmode"

kv_diag [ -e | --execute ]  run POST test items by kv"cn_test_mask" and
"cn_bootmode"

kv_diag [ -r | --result ]   show latest POST test result
kv_diag [ -n | --no   ]   show POST error code and related error string
```

12.3.1.2 IPMC Linux utility for POST/BIST tests

1. The utility ux_diag is also located in the rootfs folder "/usr/bin/", refer to the usage below for help.

```
root@cnode-pp50:/etc/cpld ux_diag
usage: ux_diag [-u|--update] [cn|s0|s1]
usage: ux_diag [-l|--list] [cn|s0|s1]
usage: ux_diag [-d|--dump] [cn|s0|s1]
usage: ux_diag [-n|--no] [cn|s0|s1]
usage: ux_diag [-h|--help]
       -u  update diagnosis configuration using /etc/diag/XX_diag.cfg
       -l  list all available test items and test states configuration
       -d  dump the test result and create /var/log/diag/XX_diag.dump
       -n  list current diagnosis test error number and err string
       -h  for help
```

Note in the text above

XX = (cn, s0, s1)

cn means IPMC

s0 means PAYLOAD0

s1 means PAYLOAD1

2. Run command "ux_diag –l cn" to list all available test items for the IPMC

```
root@cnode-pp50:/ ux_diag -l cn

              IPMC bootmode=normal
===========================================================
[TEST_STATE]   [MASK_POS]    [TEST_TYPE]     [TEST_CASE]            [TEST_TIME]

     n             0         short post     i2c                    <= 1 sec
     n             1         short post     shortmem               <= 15 sec
     n             8          long post     rtc                    <= 35 sec
     n             9          long post     memory                 <= 40 sec
     n            10          long post     nand                   <= 30 sec
     n            11          long post     bcm5389                <= 1 sec
     n            12          long post     fswitch                <= 2 sec
     n            13          long post     fpga                   <= 1 sec
     n            14          long post     frusel                 <= 1 sec
     n            15          long post     hwaddr                 <= 1 sec
     n            16          long post     ne1617                 <= 1 sec
     n            17          long post     pmc8380                <= 3 sec
     n            18          long post     atc210                 <= 2 sec
     n            19          long post     rtm                    <= 2 sec
     n            20          long post     tcam                   <= 2 sec
     n            24               bist     sfp                    <= 90 sec
     n            25               bist     fabricswitch           <= 16 min
     n            26               bist     baseswitch             <= 10 sec
root@cnode-pp50:/
```

3. Run command “ux_diag –d cn” to dump test result

```
root@cnode-pp50:/ ux_diag -d cn

                   IPMC Diagnostic Test Result
===============================================================================
[MASK_POS]  [TEST_TYPE]  [TEST_CASE] [TEST_RESULT]    [ERROR_CODE]  [ERROR_STRING]
    0      short post     i2c             passed          0          test passed
    1      short post     shortmem       passed          0          test passed
Begin to generate cn_diag.dump.
Generate cn_diag.dump OK!
root@cnode-pp50:/
```

Note: If some test items fail, you can get more details from the log file /var/log/diag/cn_diag.dump.

4. Run command “ux_diag –n cn” to list all related test result code description.

```
root@cnode-pp50:/ ux_diag -n cn
IPMC Diagnosis Error Codes List
==============================
[code]           [description]
   0                test passed
   1                not test
   2                invalid test item
   3                not response from i2c address
   4                date line test error
   5                address line test error
   6                verify 0x00000000 error
   7                verify 0xffffffff error
   8                verify 0x55555555 error
   9                verify 0xaaaaaaaa error
  10                verify 1 shift error
  11                verify address self error
  12                verify address reverse error
  13                verify address peak poke error
  14                verify address bit fade error
  15                a new second timeout
  16                invalid second duration counts
  17                month boundary test error
  18                read old data error
  19                erase old data error
  20                write test data error
  21                read  test data error
  22                verify test data error
  23                erase test data error
  24                restore old data error
  25                bcm5389 page0 test error
  26                bcm5389 page10 test error
  27                fabric switch ID error
  28                fabric register test error
  29                fpga register test error
  30                fru eeprom test error
  31                sel eeprom test error
  32                invalid hardware address
  33                adress parity verify error
  34                ne1617 ambient test error
  35                ne1617 XLR0 test error
  36                ne1617 XLR1 test error
  37                ne1617 fm2112 test error
  38                pm8380 GMAC0 test error
  39                pm8380 GMAC1 test error
  40                rtm is not present
  41                rtm eeprom test error
  42                tcam sensor 1 test error
  43                tcam sensor 2 test error
  44                tcam eeprom test error
  45                tcam is not present
  46                atc210 read error
  47                adt7462 verified error
  48                max6618 verified error
  49                mic184 ambient0 error
  50                mic184 ambient1 error
 128                frbric switch bist error
 129                base switch bist error
 130                sfp bist error
root@cnode-pp50:/
```

12.3.2 Running XLR Diagnostic Tests with KV settings

XLR diagnostic commands can be run using short/long POST or BIST.

12.3.2.1 XLR Commands for Short/Long POST tests

The kv_diag is was added to allow XLR boot loader CLI tests. Refer to the table below for its usage and options.

Table 12-6: kv_diag Usage and Options

Option	Description
–h	Shows the usage
–c	Shows the current KV set for diagnostic
–v	Makes newly set kv values valid (sets them) and displays them. See the example that follows this table.

Table 12-6: kv_diag Usage and Options

–l	Lists the available POST items in XLR boot loader
–e	Executes the diagnostic test items currently set in the KV database
–r	Shows the latest diagnostic test result
–n	Shows the diagnostic test error code

Below is an example of how to run the short POST diagnostics on bcm5482 gmac0, bcm5482 gmac1, or bcm5482 gmac2 in the XLR boot loader CLI:

a. From the XLR boot loader CLI, set the following KV keys:

```
PP50-0 $ kv s0_bootmode normal
PP50-0 $ kv s0_test_mask 11100000000000000000000000000000
```

b. Run command “kv_diag –v” to make the key valid.

```
PP50-0 $ kv_diag -v
key s0_test_mask value = "11100000000000000000000000000000"
PP50-0 $
```

c. Run command “kv_diag –c” to ensure the test cases were executed.

```
PP50-0 $ kv_diag -c
Diagnostic boot mode is set as: s0_bootmode  = "normal"
Diagnostic test mask is set as: s0_test_mask  =
"11100000000000000000000000000000"
```

d. Run command “kv_diag –e” to execute. See the output below.

```
PP50-0 $ kv_diag -e
BCM5482 gmac0 aceess success
BCM5482 gmac1 aceess success
BCM5482 gmac2 aceess success
Long post running in 0 units. Press any key to halt...
                POST Diagnostic Test Result
===========================================================
[TEST_CASE]     [MASK_POS]    [ERROR_CODE]    [TEST_RESULT]
      gphy0             0               0             Pass
      gphy1             1               0             Pass
      gphy2             2               0             Pass
PP50-0 $
```

e. Run command “kv_diag –r” to show test result. See the output below.

```
PP50-0 $ kv_diag -r
                POST Diagnostic Test Result
===========================================================
[TEST_CASE]     [MASK_POS]    [ERROR_CODE]    [TEST_RESULT]
      gphy0             0               0             Pass
      gphy1             1               0             Pass
      gphy2             2               0             Pass
```

12.3.2.2 XLR RMI Linux Utility for POST/BIST Tests

1. The ux_diag utility in RMI Linux RAM FS /usr/bin/ for XLRs provides the tests described below:

```
[root@Stn000116 jwu]$ ./ux_diag -h
usage: ux_diag [-u|--update] [cn|s0|s1]
usage: ux_diag [-l|--list] [cn|s0|s1]
usage: ux_diag [-d|--dump] [cn|s0|s1]
usage: ux_diag [-n|--no] [cn|s0|s1]
usage: ux_diag [-v]
usage: ux_diag [-h]
       -u  update diagnosis configuration using /etc/diag/XX_diag.cfg
       -l  list all available test items and test states configuration
       -d  dump the test result and create /var/log/XX_diag.dump
       -n  list current diagnosis test error number and err string
       -v  display version
       -h  for help
```

2. Run “ux_diag -l s0” to list all available test items for XLR0 as shown below.

```
 [root@localhost ~]$ ux_diag -l s0

             PAYLOAD0 bootmode=normal
==========================================================================
[TEST_STATE]   [MASK_POS]    [TEST_TYPE]        [TEST_CASE]    [TEST_TIME]

     n              0         short post       bcm5482gmac0    <=   1 sec
     n              1         short post       bcm5482gmac1    <=   1 sec
     n              2         short post       bcm5482gmac2    <=   1 sec
     n              3         short post       bcm5482gmac3    <=   1 sec
     n              4         short post       vsc7280xgmac0    <=   1 sec
     n              5         short post       vsc7280xgmac1    <=   1 sec
     n              6         short post               cpld     <=   2 sec
     n              7         short post           shortmem    <=   2 min
     n              8          long post           shortflash    <=  200 sec
     n              9          long post            fullflash     <=   7 min
     n             10          long post            fullmem    <=   hours
     n             11          long post              psram    <=  50 sec
     n             12          long post             pcmcia    <=   1 sec
     n             13          long post            tcamreg    <=   1 sec
     n             14          long post         pseudofault    <=   1 sec
     n             15          long post           uart1test    <=   2 sec
     n             24                bist          tcamentry    <=  15 sec
     n             25                bist             GEtest    <=  90 sec
     n             26                bist            XGEtest    <=  45 sec
[root@localhost ~]$
```

Note: The tcamentry test (test 24 above) with MASK_POS 24 will be skipped on XLR1 even if it is masked, it can only be executed on XLR0.

For reader convenience a formal table of the test mentioned above is listed below.

Table 12-7: XLR Diagnostic Tests

XLR Boot Loader s0_test_mask and s1_test_mask			
Bit	Test Type	Test Case	Test Duration
0	short POST	bcm5482 gmac0	~ 1 sec
1	short POST	bcm5482 gmac1	~ 1 sec
2	short POST	bcm5482 gmac2	~ 1 sec
3	short POST	bcm5482 gmac3	~ 1 sec
4	short POST	vsc7280 xgmac0	~ 1 sec
5	short POST	vsc7280 xgmac1	~ 1 sec
6	short POST	cpld	~ 1 sec
7	short POST	short memory	~ 2 min
8	long POST	part flash	~ 200 sec
9	long POST	full flash	~ 7 min
10	long POST	long memory	~ hours
11	long POST	psram	~ 50 sec
12	long POST	pcmcia	~ 1 sec
13	long POST	tcam register	~ 1 sec
14	long POST	pseudo fault[a]	~ 1 sec
15	long POST	uart 1 sipl channel	~ 1 sec
16~ 23	NA	NA	NA
24	BIST	tcamentry[b]	15 sec
25	BIST	GEtest[c]	90 sec
26	BIST	XGEtest[d]	45 sec

a. pseudofault test: Simulates a failed test, sends a fail result to application level caller even if all components pass, the test result of this item will always be “failed” if enabled by sX_test_mask.

b. tcamentry test: this BIST item includes following subtest cases:

   1: 72 bit entry test
   2: 144, 288 and 576 entry test
   3: TCAM register access test
   4: TCAM database read and write
   5: Longest prefix match

   If all the subtests pass the test passes.

c. GE test: Tests all four XLR GE ports (eth0 through eth3), if any one GE port fails the test fails.
d. : tests both XLR 10GE ports (eth4, eth5), if either fails the test fails.

3. Run command "ux_diag –d s0" to dump the test result

```
[root@localhost ~]$ ux_diag -d s0

                  PAYLOAD0 Diagnostic Test Result
==============================================================================[MAS
K_POS][TEST_TYPE][TEST_CASE][TEST_RESULT][ERROR_CODE] [ERROR_STRING]
0 short post bcm5482gmac0             passed           0        test ok.
1 short post bcm5482gmac1             passed           0        test ok.
2 short post bcm5482gmac2             passed           0        test ok.
3 short post bcm5482gmac3             passed           0        test ok.
4 short post vsc7280xgmac0            passed           0        test ok.
5 short post vsc7280xgmac1            passed           0        test ok.
6 short post cpld                     passed           0   test ok.
7 short post shortmem                 passed           0   test ok.

Begin to generate s0_diag.dump.
Generate s0_diag.dump OK!
[root@localhost ~]$
```

Note: More details about the test can be found in the log file /var/log/diag/s0_diag.dump.

4. Run command “ux_diag –n s0” to display all related test result code descriptions:

```
[root@localhost /]$ ux_diag -n s0

PAYLOAD0 Diagnosis Error Code List
===================================
[code] [description]

0 test ok.
1 not tested.
2 invalid test item.
3 test failed with illegal parameters.
4 SIPL communication error.
5 memory allocated error.
6 unable to find the test device.
7 unable to read phy id register.
8 unrecognized phy.
9 write/read register error.
10 unkown memory test type error.
11 memory walk one test error.
12 memory walk zero test error.
13 memory write own addr test error.
14 memory write unique addr test error.
15 memory with setting a 8 bit "moving inversions" algorithm as pattern test error.
16 memory with setting a 32 bit "moving inversions" algorithm as pattern test
error.
17 memory with setting modulo X access pattern test error.
18 memory bit fade test error.
19 flash erase operation error.
20 flash write operation error.
21 flash verify error.
22 psram addr space test_1 error.
23 psram addr space test_2 error.
24 psram data line test_1 error.
25 psram data line test_2 error.
26 psram addr line test error.
27 psram access by byte test error.
28 psram access by word test error.
29 pcmcia detect bad compactflash card error.
30 tcam access register error.
127 pseudo fault test error.
128 TCAM bist error.
129 GE port bist error.
130 XGE port bist error.
[root@localhost /]$
```

12.4 Indicating XLR’s POST/BIST Status Using LEDs

XLR's POST/BIST status can be determined using the front panel LEDs. This is an optional feature and requires the presence of an LED action data file:

/etc/PayPostLed.dat

The user needs to create this data file and write LED action entries into it.

- LED1 indicates XLR0's POST/BIST status
- LED2 indicates XLR1's POST/BIST status

On system startup, the ipmcd daemon reads this data file and caches LED actions.

If this data file does not exist or an LED action entry is not in the data file then the ipmcd will not act upon the LEDs during POST/BIST of the XLRs. On start/stop of POST/BIST, each XLR sends out an event on Firmware Progress Sensor to the ipmcd using “Set Sensor Reading and Event Status” command and on receipt of this command, ipmcd takes action on the LED based on previous cached action. The LED action data file syntax is shown below.

<payload id>   <event data 1>   <event data 2>   <on | off | short | long>

Where,

Payload id:

0 - XLR0

1 - XLR1

Event data 1:

0x82

Event data 2:

0x0a - start of Short POST

0x1a - finish of Short POST

0x0b - start of Long POST

0x1b - finish of Long POST

0x0c - start of BIST

0x1c - finish of BIST

LED action:

on   - LED turn ON

off   - LED turn OFF

short - LED Short Blink

long - LED Long Blink

Below are examples of how the parameters may be set.

0	0x82	0x0b	long
0	0x82	0x1b	off
1	0x82	0x0b	short
1	0x82	0x1b	off

12.5 Determining Board Build

Determine a board's build configuration by watching the console output during CNode boot as shown below.

```
Loading FPGA Device 0...
.......................................
Done.
FPGA[0] Magic 0x7e BoardID 0x0, Revision 0x93
FPGA[0] test start
FPGA[0] test passed
```

Table 12-8: Determining Board Build by Revision Number

Board Revision	PCB			XLR		Switch		Power Brick	
	P2	P2R2	P3	Commer-cial	Industrial	FM2112	FM3112	LImited Feature	Full Feature
00	√			√		√		√	
01		√		√		√		√	
02		√			√	√			√[a]
03			√		√	√			√
20	√			√			√		√
21		√		√			√		√
22		√			√		√		√
23			√		√		√		√

a. Some early prototypes revision 02 have a non-full feature power brick.

13 Product Repair and Returns

13.1 Customer Support

A detailed description of our after-sales support and support policies can be found at www.ccpu.com.

Note: Continuous Computing bears no direct responsibility for any equipment installation, protective grounding design and construction done for devices not provided by Continuous Computing, or out of the scope of designing and planning provided by Continuous Computing. Should any damage or injury occur due to the customer concerned failing to meet the requirements of related specifications with regard to construction quality, construction methods, wiring solutions, materials used, etc., the consequences should be born by the customer concerned.

13.2 Warranty

Continuous Computing (CCPU) provides 12-month warranty returns to the factory for all its hardware products. Customers can buy an extended warranty on the purchased hardware before the original warranty expires. Continuous Computing may also repair products which are not under warranty on a time and material basis.

A Return Material Authorization (RMA) number is required prior to returning any product for repairs, upgrades or advance replacements. When returning products to Continuous Computing, please address the shipment to the attention of RMA Support, and include the RMA number on the shipping label.

13.2.1 RMA Procedure

To return a product for repair first submit an RMA request online at www.ccpu.com.

If you don't have an account request one from support@ccpu.com.

13.2.2 Non-Warranty Repairs

If your equipment is out of warranty other options are available such as an extended or fixed price warranty, please contact your sales director for more information.

For non-warranty repairs or services, Continuous Computing will examine the returned hardware and send a quote for the repairs. Continuous Computing will not work on the repairs until it gets a purchase order for the repairs. If the customer chooses not to repair the hardware, they will be responsible for the cost of the repair estimation and shipping back to the customer.

13.2.3 Shipping

For products under warranty, the customer pays shipping to Continuous Computing and Continuous Computing pays for return shipment. For products not under warranty, the customer pays for shipping both ways.

13.2.4 Expedite Option for Repairs

Continuous Computing offers a program to expedite the RMA for an additional charge for all products whether under warranty or out of warranty. Please contact your sales director for more information about our Expedite RMA program.

14

Revision History

This chapter lists the revisions made to this document. Please see the Release Notes for the details of any specific release.

Table 14-1: User Manual Revision History

Revision	Date	Section: Change
11B	2011/3/11	• Updated for Software release 1.3 Update 3 with the following information: • Added FIBM overview. • Section 8.2.2, "FIBM Mode" added. • Minor editorial and formatting. improvements. • Added WatchDog support information. • See Release 1.3 Update 3 Release Notes for details.
11A	2010/9/30	• Updated code formatting with new easy to read highlighting. • Added Section 7.5.10.11, "Get IPMC Key-Value Extended" section. • Added error codes for OEM commands when Get/Set KV key fails. • Added new code formatting to whole book. • kumen command order improved.

Table 14-1: User Manual Revision History

Revision	Date	Section: Change
11A		• Added IPMC CLI section. • Updated upgrade instructions for WR PNE 2.0 SPR4. • Updated companion TCAM user guide for version 3 firmware. • Updated "Initializing the Multiboot Tool" section. • Auto-pause options added to " Using the fswcmd (Fabric Switch) Command" section. • Instructions to reboot system after BIST tests added. • Explanation of KV sX_cur_bank and sX_next_bank keys added. • Updated Section 7.3.1, "KV Keys" with FIBM key. • Added Section 9.6.4, "kumem=<size@addr>" • Added Section 12.5, "Determining Board Build" for determining board build. • Improved Section 4.1.1, "Connect to the Serial Console" instructions. • Updated Section 10.2.4.4, "Management " CPLD to set the watchdog period. Range changed from "0.2sec to 50.0 sec" to "0.4sec to 50.0 sec". Updated descriptions and methods in: • Section 11.2, "XLR bootloader Upgrade" • Section 11.2.2, "Loading Image Files" • Section 11.2.2.1, "Ping-Pong Upgrade Method" • Section 11.2.2.2, "Factory Golden Upgrade Method"