InterStream®

Packet Capturing Card User's Guide

IS4010 – 10 Gbps POSx1 PCAP PCI-X CARD
IS4110 – 10 Gbps LANx1 PCAP PCI-X CARD
IS4010E – 10 Gbps POSx1 PCAP PCI-E 8x CARD
IS4110E – 10 Gbps LANx1 PCAP PCI-E 8x CARD

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SYSMATE INC

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0 Contents

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1 Document Outline

This chapter describes overall outlines of the document - the scope, the purpose and the conventions – and defines abbrevations used in the document.

Scope of this Document

This document describes the installations of ISPCAP cards and the device driver. It also explains how to run ISPCAP sample programs.

Purpose of this Document

The purpose of this document is to provide information not only ISPCAP cards installation but also user applications development.

Conventions

Italicized sentences describe either specific or additional information under specific situations, not design concepts.

Abbrevations

- **IS**: InterStream®, InterStream
- **GBE**: Gigabit Ethernet
- **POS**: Packet Over SONET(SDH)
- **IPS**: Intrusion Prevention System
- **FPGA**: Field-Programmable Gate Array
- **ISN**: InterStream Networks
- **PCAP**: Packet Capture
- **PNET**: Packet Network
- **PSAMP**: Packet Sampling
- **GPS**: Global Positioning System
- **LOS**: Loss Of Signal
- **LOF**: Loss Of Frame
- **OOF**: Out of Frame

- **APSBF**: Automatic Protection Switching Byte Failure
- **LRDI**: Line Remote Defect Indication
- **LAIS**: Line Alarm Indication Signal
- **BIP**: Bit Interleaved Parity
- **REI**: Remote Error Indicator
- **LF**: Local Fault
- **RF**: Remote Fault
- **BER**: Bit Error Rate

2 Introduction

This chapter introduces IS4010, IS4110, IS4010E and IS4110E – ISPCAP card package, key functions and system configuration.

ISPCAP Cards

The ISPCAP card provides packet transmission/reception and monitoring for OC-192 POS(IS4010, IS4010E) or 10 Gbps LAN Ethernet(IS4110, IS4110E). It can be easily installed in a user system which supports the standard PCI-X 64-bit 100/133 MHz interface. The kinds of ISPCAP card are followings:

- InterStream® IS4010 10Gbps POSx1 PCAP PCI-X Card
- InterStream® IS4110 10Gbps LANx1 PCAP PCI-X Card
- InterStream® IS4010E 10Gbps POSx1 PCAP PCI-E 8x Card
- InterStream® IS4110E 10Gbps LANx1 PCAP PCI-E 8x Card

ISPCAP Package

It is provided as a package including followings:

- InterStream® ISPCAP Card (i.e. One of ISPCAP card's kinds)
- A compact disk which contains InterStream® drivers and example programs
- InterStream® ISPCAP Card User's Guide
- InterStream® ISN Network Library User's Guide

ISPCAP Key Functions

The ISPCAP card captures packets from OC-192 POS links or 10G LAN Ethernet links without losses, and delivers the packets to the user application. It also provides selective packet retransmission by users' demands.

The ISPCAP card implements a high performance FPGA logic which decodes received packets from the links, and delivers them to the host memory. The FPGA logic enables to maximize performance regardless of packet size and PPS (Packets per Second).

The ISPCAP package enables easy integration with user applications by providing optimized device driver software and PCAP library.

OC-192 POS/10Gbps LAN Ethernet Interfaces

The ISPCAP card provides one OC-192 POS or 10 Gbps LAN Ethernet interface. OC-192 POS interface supports an SMF optical module that operates in 9953.28 Mbps. 10 Gbps LAN Ethernet interface supports an SMF optical module that operates in 10.7 Gbps.

PCI-X 64bit 100/133MHz / PCI-Express 8x Bus Interface

The ISPCAP card supports PCI-X 64-bit 100/133 MHz or PCI-Express 8x bus interface. Thus, it can reduce host CPU time and memory usage for delivering packets into the system memory.

Packet Processing Engine

The ISPCAP card implements a hardware-based packet processing engine which decodes and delivers packets into the system memory, improving overall system performance by minimizing CPU usage. The ISPCAP card and its driver software have been optimized for packet reception performance so that we guarantee high performance and reasonable packet delivery latency.

Supporting Linux Operating Systems

The ISPCAP package runs on 32- or 64-bit Linux Kernel 2.4.x or 2.6.x versions.

ISN Network Library

ISN Network Library provides functions to control and monitor ISPCAP card, facilitating the integration with user applications.

Optimized PCAP Library

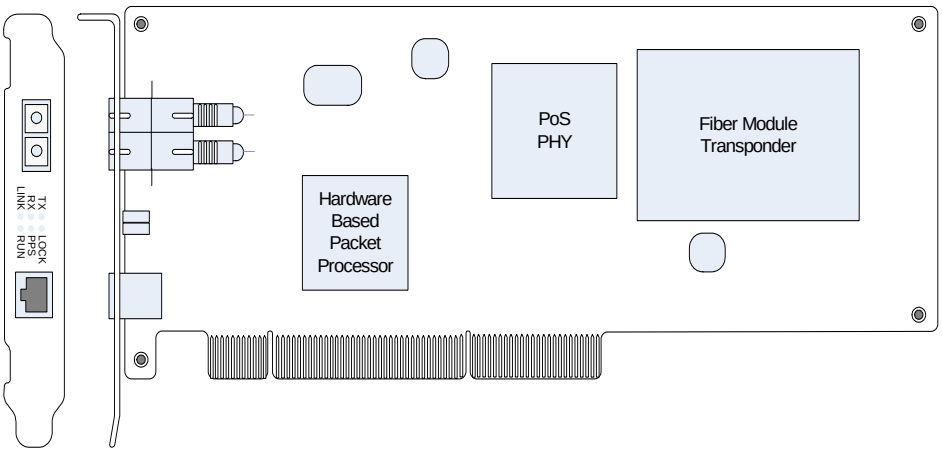
Together with ISN Network Library, we provide Optimized PCAP Library which has been rewritten to support ISN cards. Since Optimized PCAP Library provides same APIs as the standard PCAP library, it facilitates to integrate existing applications. Using the Optimized PCAP Library, it is possible to achieve high performance which is almost same as the performance obtained by ISN Network Library.

Technical Support for Integration and Customization

Sysmate Inc. spares no effort in supporting system integration and customization. In particular, we are open to develop customized hardware logics, for example, packet filter engine and pattern matching engine.

Outward Form of IS4010 Card

[Figure 1] shows the IS4010 card which consists of one 10G POS interface, Fiber-Module transponder, POS PHY chipset, and FPGA packet processing engine. The received packets by the hardware chipsets are delivered to system memory via PCI-X bus.

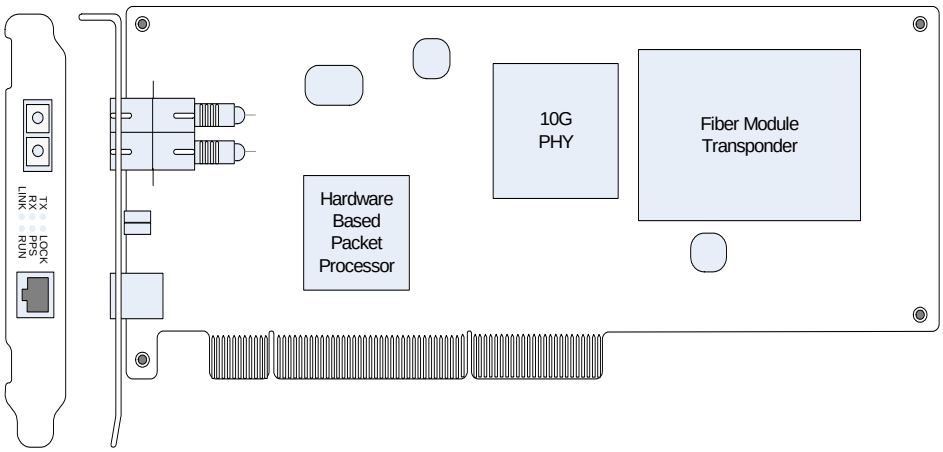


[Figure 1] IS4010 10Gbps POSx1 PCAP PCI-X Card Configuration

The bracket shown in left side of [Figure 1] shows the front view when the card is installed in the system. There are one OC-192 POS SC connector, GPS RJ-45 connector, LED-1 lights for link status as well as sending ans receiving status, and LED-2 lights for GPS module running status as well as synchronizing and rocking status. There is a barcode that says the card's name and serial number at the right bottom of the board.

Outward Form of IS4110 Card

[Figure 2] shows the IS4110 card which consists of one 10G LAN interface, Fiber-Module transponder, 10G PHY chipset, and FPGA packet processing engine. The received packets by the hardware chipsets are delivered to system memory via PCI-X bus.

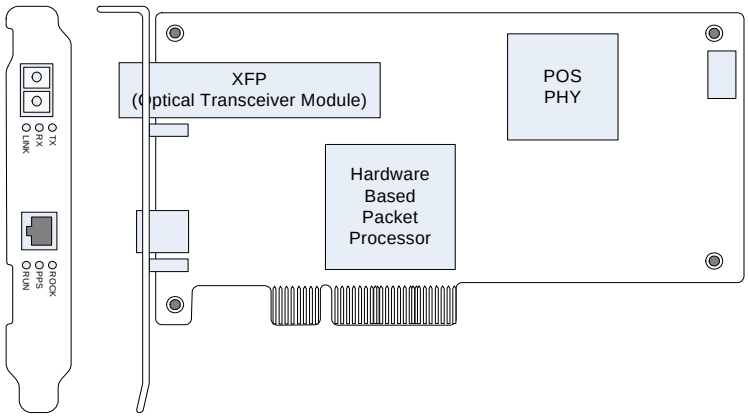


[Figure 2] IS4110 10Gbps LANx1 PCAP PCI-X Card Configuration

The bracket shown in left side of [Figure 2] shows the front view when the card is installed in the system. There are one 10G LAN Ethernet SC connector, GPS RJ-45 connector, LED-1 lights for link status as well as sending ans receiving status, and LED-2 lights for GPS module running status as well as synchronizing and rocking status. There is a barcode that says the card's name and serial number at the right bottom of the board.

Outward Form of IS4010E Card

[Figure 3] shows the IS4010E card which consists of OC-192 POS interfaces, POS PHY chipset, and the FPGA packet processing engine. The received packets by the hardware chipsets are delivered to system memory via PCI-Express bus.

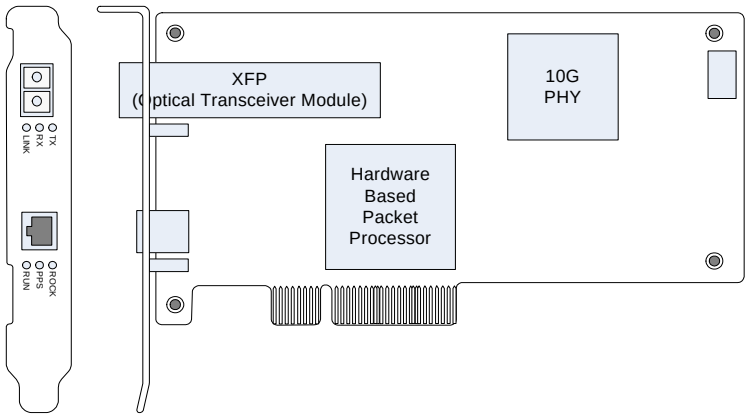


[Figure 3] IS4010E 10Gbps POSx1 PCAP PCI-Express Card Configuration

The bracket shown in left side of [Figure 3] shows the front view when the card is installed in the system. There are OC-192 POS XFP connector, GPS RJ-45 connector, LED-1 lights for link status as well as sending and receiving status, and LED-2 lights for GPS moduel running status as well as synchronizing and rocking status. There is a barcode that says the card's name and serial number at the right bottom of the board.

Outward Form of IS4110E Card

[Figure 4] shows the IS4110E card which consists of 10Gbps LAN Ethernet interfaces, 10G PHY chipset, and the FPGA packet processing engine. The received packets by the hardware chipsets are delivered to system memory via PCI-Express bus.



[Figure 4] IS4110E 10Gbps LANx1 PCAP PCI-Express Card Configuration

The bracket shown in left side of [Figure 4] shows the front view when the card is installed in the system. There are 10Gbps LAN XFP connector, GPS RJ-45 connector, LED-1 lights for link status as well as sending and receiving status, and LED-2 lights for GPS moduel running status as well as synchronizing and rocking status. There is a barcode that says the card's name and serial number at the right bottom of the board.

3 ISPCAP Card Installation

This chapter describes ISPCAP card installation prerequisites and procedures.

Prerequisites for ISPCAP Installation

Make sure that your system, in which the ISPCAP card will be installed, satisfies following requirements before installing that card.

Prerequisites of 32-bit Linux Systems

Following prerequisites should be required to install the ISPCAP card in **32-bit Linux systems**:

- A system, which has either Pentium or Xeon processor(s), and runs a 32-bit Linux operating system.
- At least one 64-bit PCI-X slot supporing PCI-X v1.0 64-bit 100/133 MHz standard (i.e. IS4010, IS4110)
- At least one PCI-Express slot supporing PCI-Express v1.0 8xbus standard (i.e. IS4010E, IS4110E)
- At least 256MB system memory
- Linux Kernel version 2.4.x or 2.6.x

Prerequisites of 64-bit Linux Systems

Following prerequisites should be required to install the ISPCAP card in **64-bit Linux systems**:

- A system, which has either Pentium or Xeon processor(s), and runs a 64-bit Linux operating system.
- At least one 64-bit PCI-X slot supporing PCI-X v1.0 64-bit 100/133 MHz standard (i.e. IS4010, IS4110)

- At least one PCI-Express slot supporing PCI-Express v1.0 8xbus standard (i.e. IS4010E, IS4110E)
- At least 256MB system memory
- Linux Kernel version 2.4.x or 2.6.x

[NOTE] IS4010E and IS4110E PIC-E 8x cards work best in a 64-bit Linux operating system. Recommend to install the card to 64 bit LINUX system.

Checkpoints before Installing ISPCAP

We recommend ensuring following checkpoints before installing the ISPCAP card:

1. Make sure that the system, in which the ISPCAP card will be installed, satisfies all prerequisites
2. Make sure the BIOS of the system up-to-date
3. Shutdown the system (by using Linux commands, e.g. init0).
4. Unplug the power cord of the system.
5. Check the contents of ISPCAP package to make sure that it contains all elements and there is no breakage in the card in appearance. Please contact your product supplier if there is any problem.

Installation of ISPCAP Card

Installing ISPCAP Card

Follow the instructions to install ISPCAP card:

1. Make sure the power cord of your system unplugged.
   [CAUTION] The card might be damaged if the power cord is not unplugged even though the system power is off.
2. Choose a PCI slot for the ISPCAP card, and then insert it to that slot. The ISPCAP card works properly only if it is installed in either a PCI-X 100/133 MHz or PCI-Express 8x bus slot. If you are unaware of PCI slot specification in your system, please refer to the system manual.
   [NOTE] ISPCAP card works best in PCI-X 64-bit 133MHz (i.e. IS4010, IS4110) or PCI-Express 8x bus (i.e. IS4010E, IS4110E) slots.
3. Since ISPCAP card has been designed to support PCI-X 64-bit or PCI-E 8x bus interface,
   [CAUTION] Make sure to insert card into the 64-bit slot (i.e. not into 32-bit slots) or PCI-E 8x bus slot. (i.e. not into 1xbus or 2xbus or 4xbus)
4. Plug the power cord, and start up the system.

Connecting Network Cables

Follow the instructions to connect to the network after installing the ISPCAP card:

1. The ISPCAP card supports OC-192 POS or 10Gbps LAN Ethernet SMF optical fiber interface, so get ready the cable.
2. Remove the dust from protection cap of the installing ISPCAP card, and connect the SMF fiber cable to the card
3. Check whether the connected port works properly by examining link LED in the ISPCAP card. If the link status does not show ON, make sure the opposite side of the cable is connected correctly.

ISPCAP Network Interface LED-1

The ISPCAP card has LED-1 to examine the status of a port in the card. [Table 1] summarizes LED-1 in the ISPCAP card.

[Table 1] ISPCAP Network interface LEDs

LED-1/2	Status	Description
Link	On	The link works in normal
	Off	The link does not work due to some problems such as improper connection, cable fault, etc
RX	Blinking	Packets are coming in from the network
	Off	No packet is coming in from the network
TX	Blinking	Packets are going out to the network
	Off	No packet is going out to the network

ISPCAP GPS Interface LED-2

The ISPCAP card has LED-2 to examine the status of a GPS status in the card. [Table 2] summarizes LED-2 in the ISPCAP card.

[Table 2] ISPCAP GPS interface LED-2

LED-2/2	Status	Description
RUN	On	The GPS module works in normal.
	Off	The GPS module does not work due to some problems such as improper connection, cable fault, etc.
PPS	Blinking	The synchronous signals are going out to the GPS system for synchronizing.
	Off	No synchronous signa is going out to to the GPS system.
ROCK	Blinking	The GPS interface are locking with the GPS system.
	Off	The GPS interface are unlocking with the GPS system.

4 ISPCAP Linux Driver Installation

This chapter describes Linux driver installation and configuration for the ISPCAP card.

Checkpoints before Installing ISPCAP Linux Driver

The ISPCAP device driver is provided as follows:

- A compressed TAR file, which includes compiled binary files according to Linux distribution and kernel version
- The TAR file has a naming convention as follows:
  ispcap-<revision>-<target>.tar.gz
  * revision: ISPCAP software package version number
  * target: targeted Linux version
- For example, in the case that Linux distribution is SuSE-10.0-x86_64 and ISPCAP driver version is 1.1.0, the TAR name would be as follows:
  ispcap-rev-1.1.0-suse-10.0-x86_64.tar.gz

[NOTE] Before installing the driver, please make sure the driver version is compatible to Linux version of your system. If you can not find the compatible driver, you need to contact the product supplier.

[CAUTION] The ISPCAP card might not work properly if the Linux and kernel versions of the driver mismatch to the system.

Installation of the ISPCAP Driver

Follow the instructions to install the ISPCAP driver:

1. Decompress the driver TAR file as follows:
   $ tar xvvzf ispcap-<rev>-<target>.tar.gz
2. As a result of the step 1, driver files will be placed in ./ispcap-<rev>-<target> directory.
3. Load the driver into Linux as follows:
   $ cd ispcap-<rev>-<target>/bin
   $ insmod ispcap.ko

ISPCAP Directory and Files

[Figure 5] shows the directory and the files after the driver tar file is extracted.

```
$ ls -l
drwxr-xr-x   2 isn users  344 Jan  5 01:27 bin
drwxr-xr-x   2 isn users  248 Feb 11 23:04 include
drwxr-xr-x   2 isn users  384 Jan 19 03:05 lib
drwxr-xr-x   2 isn users  520 Jan 19 02:10 sample
-rw-r--r--   1 isn users 2304 Nov 16 04:23 Makefile
-rw-r--r--   1 isn users 1827 Oct 19 21:02 config.mk
```

[Figure 5] ISPCAP TAR contents

The bin directory holds driver image files and utility files. The include directory holds ISN library header files for API function prototypes and data structures, while lib directory holds ISN library file. In addition, we provide example source codes for both ISN library and PCAP library in sample directory, and “Makefile” and “config.mk” are used to compile the example programs.

Configuration of ISPCAP Driver Options

The ISPCAP card supports OC-192 POS or 10Gbps LAN Ethernet interface. When the card connects to the network, we can set up several options on the card. The value of options is set up, when the card's driver is loaded to the system.

ISPCAP Driver Options

[Table 3] summarizes the driver options in the ISPCAP card.

[Table 3] ISPCAP Driver Options

Options	Description	
pos_sonet	It is to decide the network type that is used in OC-192 POS interface. (Note: pos_sonet is supported in IS4010 and IS4010E)	
	0	Auto-Sensing disable
	1	Auto-Sensing enable (default)
pos_fcs_vaildation	It is to decide the CRC calculation method that is used in OC-192 POS interface. It calculate total of the packet, after destuffing or descrambling the packet that is received. (Note: pos_fcs_vaildation is supported in IS4010 and IS4010E)	
	0	CRC-CCITT, CRC calculation in 16 bits
	1	CRC-32, CRC calculation in 32 bits (default)
pos_fcs_strip	It is to decide that receive the packet with/without CRC field in OC-192 POS interface. (Note: pos_fcs_strip is supported in IS4010 and IS4010E)	
	0	Packet reception with CRC field
	1	Packet reception without CRC field
pos_descramble	It is to decide whether to descramble or not to descramble the packet that was received in OC-192 POS interface. (Note: pos_descramble is supported in IS4010 and IS4010E)	
	0	No descrambling packet reception
	1	Descrambling packet reception (default)

<table>
<tr><td>pos_scramble</td><td>It is to decide whether to descramble or not to descramble the packet that will be transmitted in OC-192 POS interface. (Note: pos_scramble is supported in IS4010 and IS4010E)<table><tr><td>0</td><td>No descrambling packet transmission</td></tr><tr><td>1</td><td>Descrambling packet transmission (default)</td></tr></table></td></tr>
<tr><td>pos_c2</td><td>It is to decide the POS reception mode according to c2 value in OC-192 POS interface. (Note: pos_scramble is supported in IS4010 and IS4010E)<table><tr><td>22(16h)</td><td>PPP, HDLC frame reception mode (default)</td></tr><tr><td>207(CFh)</td><td>ATM cell or packet reception mode</td></tr></table></td></tr>
<tr><td>pos_minpktlen</td><td>It is possible to change the minimum reception packet size during the driver action in OC-192 POS interface. (Note: pos_scramble is supported in IS4010 and IS4010E)<table><tr><td>8(default)~4096</td></tr></table></td></tr>
<tr><td>pos_maxpktlen</td><td>It is possible to change the maximum reception packet size during the driver action in OC-192 POS interface. (Note: pos_scramble is supported in IS4010 and IS4010E)<table><tr><td>1536(default)~4096</td></tr></table></td></tr>
<tr><td>pos_10g</td><td>IS4010E and IS4110E are identical cards physically among ISPCAP card products.
According to setting of this option in the driver, the card works as 10G POS or to 10G LAN card.
(Note: pos_10g is supported in IS4010E and IS4110E)<table><tr><td>0</td><td>10G LAN (default)</td></tr><tr><td>1</td><td>10G POS</td></tr></table></td></tr>
</table>

ISPCAP Driver Options Configuration

When loading the driver to Linux OS using the command ‘insmod’, configure ISPCAP driver option together. For the usage of ‘insmod’, please refer to ‘insmod’ manual.

[Figure 6] shows the option configuration that uses 16bits CRC calculation and receives packet without CRC field in SONET network.

```
#insmod is_driver.ko pos_sonet=0 pos_fcs_validation=0 pos_fcs_strip=1
```

[Figure 6] Example of driver options configuration in ISPCAP-IS4010

[Figure 7] shows the option configuration that receives packets in PPP/HDLC frame reception mode and descrambles received packets as 10G POS interface card.

```
#insmod is_driver.ko pos_10g=1 pos_c2=22 pos_descramble=1
```

[Figure 7] Example of driver options configuration in ISPCAP-IS4010E

[Figure 8] shows the option configuration for ISPCAP card to run as 10G LAN interface card. This time, the related options to POS are not used.

```
#insmod is_driver.ko pos_10g=0
```

[Figure 8] Example of driver options configuration in ISPCAP-IS4110E

ISPCAP Driver Interfaces

There are two interfaces to control the card as well as to receive packets:

- Driver Control Interface, which requires a Linux network interface (e.g. is0, is1, etc), provides functions to control the card.
- Data Reception Interface, which requires a Linux device file (e.g. /dev/isa0, /dev/isb0, etc), provides functions to receive packets.

The command “isconfig” is to configure and examine ISPCAP card. Like “ifconfig” in Linux, isconfig requires a network interface name, such as “is0”. On the other hand, a Linux device file name is required as an argument to control packet reception. That is, application programs can read packets from the given device file by using file system functions, provided in ISN library or PCAP library. For further details of the libraries, please refer to the relevant documents.

ISPCAP Control Interface Configuration

As mentioned, ISPCAP control interface requires a network interface. In general, Linux systems assign a unique name to identify an Ethernet interface (e.g. eth0). Similarly, network interfaces in ISPCAP card has unique names such as “is0”, “is1”, and so on. For those interfaces, it is possible to use “ifconfig” command to control them just like traditional Ethernet interfaces. Furthermore, the “isconfig” command can be used for more specific functions provided for ISPCAP card. Such network interfaces’names should be registered when the ISPCAP driver is loaded into the Linux operating system.

ISPCAP Data Reception Interface Configuration

ISPCAP requires a device file to receive packets from the relevant ISPCAP card. In other words, the corresponding device file should be created prior to reading packets from each port in the ISPCAP card, and then it is possible to receive packets from the port using the created device file. Hence the device file should have a unique name to identify each port in the system. For example, in a system which has two ISPCAP cards, the name “/dev/isa0” refers to port 0 in the first card, while the name “/dev/isb0” refers to port 0 in the second card. Likewise, the name “/dev/isa1” and “/dev/isb1” refer to port 1 in the first card and port 1 in the second card, respectively. According to the naming convention, the letter after “is” (e.g. “a”, “b”, etc) identifies each card, and the number after the card identifier (e.g., “0”, “1”, etc) distinguishes each port in the card.

```
$ mknod /dev/isa0 c 100 0
$ mknod /dev/isa1 c 100 1
$ mknod /dev/isb0 c 101 0
$ mknod /dev/isb1 c 101 1
```

[Figure 9] Example of ISPCAP device files creation

To create device files relevant to an ISPCAP card, the command “mknod” should be used, as shown in [Figure 9]. After creating devices files once, it is possible to use them permanently. Depending on the Linux version, however, it sometimes requires to edit “/etc/MAKEDEV” file in order to create the device files automatically in the system booting time.

ISPCAP Card Status

After installing the ISPCAP card and the relevant driver in the system, it is possible to examine the status of the ISPCAP card and the driver by using “isconfig” command. As mentioned, “isconfig” command provides more specific functions compared to traditional “ifconfig”.

[CAUTION] InterStream hardware and software has been upgraded by users’ demands. Hence, the functions of “isconfig” might be different depending on the versions of hardware and/or the driver, so you need to make sure the versions in the release note before installing the card.

ISPCAP Card Operation Status

To check the operation status of the ISPCAP card, you can run the command “isconfig”, as shown in [Figure 10].

```
$ ./isconfig is0
is0     InterStream 4110E 10 Gbps LANx1 PCAP Card, PCI-Express 8x
        Interface:up dma:dac interrupts:0 rxp:0 txp:0 phy:0
        SPPE version-1.11-20070507 base:ffff8104207fa400h irq:177
        HPPE version-225.00-20070309 base:0000c000h
        Port0 OC-10G:LAN SUNI/9953-revC base:10040000h
              LINK:ok LF:ok RF:ok LOS:ok BER:ok SYNC:fail
           RX PATH-disable CRCSTRIP-disable MIN:64 MAX:1518
              PSAMP:count-based-sampling 1-out-of-1 drops:0
              packets:0 drops:0 errors:0 bytes:0
           TX PATH-enable SCRMBL-disable
              packets:0 drops:0 errors:0 bytes:0
         USER dev:/dev/isa0 no users
```

[Figure 10] Example of ISPCAP card operation status

ISPCAP Link Operation Status

To examine whether the cable is properly connected to the ISPCAP interface port, you can run “isconfig” command, as shown in [Figure 11].

```
$ ./isconfig is0
is0     InterStream 4010 10 Gbps PoSx1 PCAP Card, PCIX-64bit-100/133Mhz
        Interface:up dma:dac interrupts:2 rxp:0 txp:0 phy:1
        SPPE version-1.01-20060308 base:1021e894400h irq:16
        HPPE version-1.01-20060223 base:0000c000h
        Port0 OC-192:POS SUNI/9953-revC base:10080000h CRC-32 C2:16h
              LOS:fail LOF:fail OOF:fail APSBF:fail LRDI:fail LAIS:fail
           RX PATH-disable DESCRMBL-disable CRCSTRIP-dsable MIN:8 MAX:1536
              PSAMP:count-based-sampling 1-out-of-1 drops:0
              packets:0 drops:0 errors:0 bytes:0
           TX PATH-disable SCRMBL-enable
              packets:0 drops:0 errors:0 bytes:0
         USER dev:/dev/isa0 no users
```

[Figure 11] Example of ISPCAP link operation status (abnormal status)

To make sure that the link works normally, six datas – LOS, LOF, OOF, APSBF, LRDI and LAIS – should be examined in IS4010 and IS4010E. If all of them have “ok” values, the status of the link is normal; otherwise, it means the link does not work properly due to some problems such as cable connection error.

[NOTICE] There are the other datas – LINK, LF, RF, LOS, BER and SYNC - in IS4110 and IS4110E. If all of them have “ok” values, the status of the link is normal in them as shown in [Figure 13].

[Figure 11] shows an example that shows the links are in abnormal status. Please refer to “Troubleshooting” chapter to resolve this kind of problem.

When the cable is correctly connected between the ISPCAP card and the peer system, the link operation status will be displayed as shown in [Figure 12] and [Figure 13].

```
$ ./isconfig is0
is0     InterStream 4010E 10 Gbps PoSx1 PCAP Card, PCI-Express 8x
        Interface:up dma:dac interrupts:0 rxp:0 txp:0 phy:0
        SPPE version-1.11-20070507 base:ffff81041e90dc00h irq:177
        HPPE version-225.00-20070309 base:0000c000h
        Port0 OC-192:POS SUNI/9953-revC base:10040000h CRC-32 C2:16h
              LOS:ok LOF:ok OOF:ok APSBF:ok LRDI:ok LAIS:ok
           RX PATH-disable DESCRMBL-enable CRCSTRIP-enable MIN:8 MAX:1536
              PSAMP:count-based-sampling 1-out-of-1 drops:0
              packets:0 drops:0 errors:0 bytes:0
           TX PATH-disable SCRMBL-enable
              packets:0 drops:0 errors:0 bytes:0
         USER dev:/dev/isa0 no users
```

[Figure 12] Example of ISPCAP-10G POS link operation status

[Table 4] summarizes IS4010 and IS4010E's 10G POS link operation status.

[Table 4] ISPCAP-10G POS link operation status

Info.	Value	Description
LOS	ok	No loss-of-signal, the link is normal.
	fail	Loss-of-signal, the link is not normal.
LOF	ok	No loss-of-frame, the link is normal.
	fail	Loss-of-frame, the link is not normal.
OOF	ok	No out-of-frame, the link is normal.
	fail	Out-of-frame, the link is not normal.
APSBF	ok	No APS byte failure, the link is normal.
	fail	APS byte failure, the link is normal.
LRDI	ok	The line remote defect indication is normal
	fail	The line remote defect indication is not normal.
LAIS	ok	The line alarm indication signal is normal.
	fail	The line alarm indication signal is not normal.

```
$ ./isconfig is0
is0     InterStream 4110E 10 Gbps LANx1 PCAP Card, PCI-Express 8x
        Interface:up dma:dac interrupts:0 rxp:0 txp:0 phy:0
        SPPE version-1.11-20070507 base:ffff8104207fa400h irq:177
        HPPE version-225.00-20070309 base:0000c000h
        Port0 OC-10G:LAN SUNI/9953-revC base:10040000h
              LINK:ok LF:ok RF:ok LOS:ok BER:ok SYNC:fail
           RX PATH-disable CRCSTRIP-disable MIN:64 MAX:1518
              PSAMP:count-based-sampling 1-out-of-1 drops:0
              packets:0 drops:0 errors:0 bytes:0
           TX PATH-enable SCRMBL-disable
              packets:0 drops:0 errors:0 bytes:0
         USER dev:/dev/isa0 no users
```

[Figure 13] Example of ISPCAP-10G LAN link operation status

[Table 5] summarizes IS4110 and IS4110E's 10G LAN link operation status.

[Table 5] ISPCAP-10G LAN link operation status

Info.	Value	Description
LINK	ok	The link is correctly connected to the peer.
	fail	The link is NOT connected to the peer.
LF	ok	No local-fault, the link is normal.
	fail	Local-fault, the link is not normal.
RF	ok	No remote-fault, the link is normal.
	fail	Remote-fault, the link is not normal.
LOS	ok	No loss-of-frame, the link is normal.
	fail	Loss-of-frame, the link is not normal.
BER	ok	No bit-error-rate, the link is normal.
	fail	Bit-error-rate, the link is not normal.
SYNC	ok	The link successfully synchronizes to the peer.
	fail	The link fails to synchronize to the peer.

ISPCAP Packet Reception

The "isconfig" command can be used to start and terminate packet reception from the ISPCAP card.

The following command is to start up packet reception from the ISPCAP card (for example, is0 interface).

- $ isconfig is0 up

On the other hand, the following command is used to terminate packet reception from the interface.

- $ isconfig is0 down

```
$ ./isconfig is0
is0     InterStream 4010 10 Gbps PoSx1 PCAP Card, PCIX-64bit-100/133Mhz
        Interface:up dma:dac interrupts:2 rxp:0 txp:0 phy:1
        SPPE version-1.01-20060308 base:1021e894400h irq:16
        HPPE version-1.01-20060223 base:0000c000h
        Port0 OC-192:POS SUNI/9953-revC base:10080000h CRC-32 C2:16h
              LOS:ok LOF:ok OOF:ok APSBF:ok LRDI:ok LAIS:ok
           RX PATH-enable DESCRMBL-enable CRCSTRIP-enable MIN:8 MAX:1536
              PSAMP:count-based-sampling 1-out-of-1 drops:0
              packets:0 drops:0 errors:0 bytes:0
           TX PATH-enable SCRMBL-enable
              packets:0 drops:0 errors:0 bytes:0
         USER dev:/dev/isa0 no users
```

[Figure 14] ISPCAP packet reception status

In [Figure 14], “interface:up” means that the interface has been started to receive packets. In the case that the interface is terminated packet reception, the status will be changed like “interface:down”. The “RX-PATH” displays packet reception status in the PHY chip; that is, “RX-PATH-enable” implies that packets have been received in the PHY chip normally. This “RX-PATH” value is changed to enable in the case that the link has been connected properly and the start-up command has been triggered.

ISPCAP Statistics

The “isconfig” command can be also used to examine statistics for the card and the driver. In addition, it displays packet reception statistics of ISPCAP applications. [Figure 15] shows an example. In the figure, each port has “RX” statistics, which include the number of packets received in the hardware, the number of packets dropped in the hardware, the number of error packets detected in the PHY, and total number of bytes of received packets. The error packets include CRC error packets and length error packets. The statistics are basically obtained by reading 32-bit long registers, so the values can be wrapped around (i.e. overflown).

```
$ ./isconfig is0
is0     InterStream 4010 10 Gbps PoSx1 PCAP Card, PCIX-64bit-100/133Mhz
        Interface:up dma:dac interrupts:2 rxp:0 txp:0 phy:1
        SPPE version-1.01-20060308 base:1021e894400h irq:16
        HPPE version-1.01-20060223 base:0000c000h
        Port0 OC-192:POS SUNI/9953-revC base:10080000h CRC-32 C2:16h
              LOS:ok LOF:ok OOF:ok APSBF:ok LRDI:ok LAIS:ok
           RX PATH-enable DESCRMBL-enable CRCSTRIP-enable MIN:8 MAX:1536
              PSAMP:count-based-sampling 1-out-of-1 drops:0
              packets:277052099 drops:6451697 errors:0 bytes:0
           TX PATH-enable SCRMBL-enable
              packets:0 drops:0 errors:0 bytes:0
         USER dev:/dev/isa0 user:isds pid:1040 hf:1h
              START POL read_timeout:0(msec) snaplen:1536 cpu:0
              RX packets:270589399 drops:0 errors:0 bytes:0
              TX packets:0 drops:0 errors:0 bytes:0
```

[Figure 15] Example of ISPCAP statistics

In [Figure 15], “USER” field displays the relevant device file and statistics for applications: “RX packets” shows total number of received packets, the number of dropped packets, the number of error packets, and the number of total bytes of the packets received in applications from the device file. For the reasons of error packets, please refer to PCAP Library User’s Guide or ISN Library User’s Guide.

[NOTE] “TX packets” under “USER” field simply displays transmission statistics (compared to “RX packets” field).

ISPCAP 10G POS PHY Status

By using the command “isconfig”, it is possible to examine ISPCAP POS PHY interfaces, as shown in [Figure 16].

```
$ ./isconfig is0:0 port
is0     InterStream 4010 10 Gbps PoSx1 PCAP Card, PCIX-64bit-100/133Mhz
        Interface:up dma:dac interrupts:2 rxp:0 txp:0 phy:1
        SPPE version-1.01-20060308 base:1021e894400h irq:16
        HPPE version-1.01-20060223 base:0000c000h
        Port0 OC-192:POS SUNI/9953-revC base:10080000h CRC-32 C2:16h
              LOS:ok LOF:ok OOF:ok APSBF:ok LRDI:ok LAIS:ok
           RX PATH-enable DESCRMBL-enable CRCSTRIP-enable MIN:8 MAX:1536
              packets: 0 fcs:0 abt:0 min:0 max:0 bytes:0
              SOH counters: BIP:0
              LOH counters: BIP:0 REI:0
              POH counters: BIP:0 REI:0 PPJE:0 PNJE:0
           TX PATH-disable SCRMBL-enable
              packets: 0 abt:0 bytes:0
              POH counters: PJPMON:0 NJPMON:0
```

[Figure 16] ISPCAP POS PHY status

The detailed information is as follows:

- CRC-32/CRC-CCITT
  CRC calculation method that is used in POS PHY.
- C2: 16h/CFh
  Packets reception mode in POS PHY
  (16h: PPP, HDLC frame reception mode)
  (CFh: ATM cell or Packets reception mode)
- DESCRMBL: enable/disable
  Enable status or disable status of descramble in POS PHY.
- CRCSTRIP: enable/disable
  The packets that is received in POS PHY include or do not include CRC filed
- MIN, MAX
  The Maximum and Minmum packet size that can be received in POS PHY
- SCRMBL: enable/disable
  Enable status or disable status of scramble in POS PHY.

[NOTE] Above options are initial set to ISPCAP-IS4010/IS4010E POS PHY. If you need to change these options, please contact us.

In [Figure 16], “TX” and “RX” fields display the transmission and reception statistics of POS PHY. The statistics values are reset whenever “isconfig” command is triggered. Sometimes there might be error frames transiently due to POS PHY initialization. If the number of dropped frames still shows non-zero even after repeating “isconfig” command, it means the port does not work properly. In this case, please contact the product supplier.

ISPCAP Card and Driver Configuration

ISPCAP Card Pause and Resume

It is possible to pause and resume packet reception in the ISPCAP card.

The following command is to pause packet reception for the ISPCAP network interface “is0”.

- $ isconfig is0 down

The following command is to resume packet reception for the network interface “is0”.

- $ isconfig is0 up

By doing so, you can pause and resume packet reception in the ISPCAP card.

POS/PHY CRC Mode Configuration

It is possible to change the POS/PHY CRC mode during the driver running in the ISPCAP-IS4010 and IS4010E card.

[CAUTION] But it stops ISPCAP card operating for a short time.

The following command is to change CRC mode to CRC-CCITT mode in the ISPCAP card’s POS/PHY.

- $ isconfig is0:0 pos-crc 0

The following command is to change CRC mode to CRC-32 mode in the ISPCAP card’s POS/PHY.

- $ isconfig is0:0 pos-crc 1

POS/PHY CRC Stripper Mode Configuration

It is possible to change the POS/PHY CRC Stripper mode during the driver running in the ISPCA card.

[CAUTION] But it stops ISPCAP card operating for a short time.

The following command is to change CRC Stripper disable mode to CRC Stripper enable mode in the ISPCAP card’s POS/PHY.

- $ isconfig is0:0 pos-crcstrip enable

The following command is to change CRC Stripper enable mode to CRC Stripper disable mode in the ISPCAP card's POS/PHY.

- $ isconfig is0:0 pos-crcstrip disable

POS/PHY Descramble Mode Configuration

It is possible to change the POS/PHY Descramble mode during the driver running in the ISPCAP card.

[CAUTION] But it stops ISPCAP card operating for a short time.

The following command is to change Descramble disable mode to Descramble enable mode in the ISPCAP card's POS/PHY.

- $ isconfig is0:0 pos-descramble enable

The following command is to change Descramble enable mode to Descramble disable mode in the ISPCAP card's POS/PHY.

- $ isconfig is0:0 pos-descramble disable

POS/PHY C2 Mode Configuration

OC-192 POS frame header has C2 value. According to the value, POS packet reception method is decided.

If C2 value is 16h, POS is PPP, HDLC frame reception mode. If C2 value is CFh, POS is ATM cell or packet reception mode.

It is possible to change the POS/PHY C2 mode during the driver running in the ISPCAP-IS4010 and IS4010E card.

[CAUTION] But it stops ISPCAP card operating for a short time.

The following command is to change C2 value to 16h mode in ISPCAP card's POS/PHY.

- $ isconfig is0:0 pos-c2 22

The following command is to change C2 value to CFh mode in ISPCAP card's POS/PHY..

- $ isconfig is0:0 pos-c2 207

POS/PHY Reception Packet Size Configuration

It is possible to change the POS/PHY the MAX/MIN reception packet size in the driver running in the ISPCAPcard.

The Minimum packet size is from 8 to 4096 bytes(default 8 bytes). The Maximum packet size is from 1536 to 4096 bytes(default 1536 bytes).

[CAUTION] But it stops ISPCAP card operating for a short time.

The following command is to change MIN reception packet size to ‘n’ bytes in the ISPCAP card’ POS/PHY.

- $ isconfig is0:0 pos-minpktlen ‘n’

The following command is to change MAX reception packet size to ‘n’ bytes in the ISPCAP card’ POS/PHY.

- $ isconfig is0:0 pos-maxpktlen ‘n’

[NOTE] The ‘n’ means packet’s integer size.

POS/PHY Packet Sampling Snap Size Configuration

It is possible to change the POS/PHY packet sampling snap size and count in the driver running in the ISPCAP card.

The snap size is from 1 to 16384 bytes. The count value is from 1 to 16384.

[CAUTION] But it stops ISPCAP card operating for a short time.

The following command is to change packet sampling snap size to ‘n’ bytes in the ISPCAP card’ POS/PHY.

- $ isconfig is0:0 psamp-snaplen n

The following command is to change packet sampling count to ‘n’ value in the ISPCAP card’ POS/PHY.

- $ isconfig is0:0 psamp-count n

[NOTE] The ‘n’ means packet’s integer size and count’s integer value.

5 ISPCAP Example Programs

This chapter introduces example programs for the ISPCAP card. There are two packet reception interfaces for the user applications. The one is PCAP library interface which is one of Linux open software, and the other is ISN library provided by Sysmate Inc. This chapter provides examples of both interfaces (PCAP library and ISN library), and describes how to run the examples. Please refer to PCAP Library User's Guide and ISN Library User's Guide for detailed functions and APIs.

ISN Library Examples

PMON Example

PMON example program, which is located in "bin/pmon" directory, displays packet reception statistics by calling ISN library. This example shows a way that how to use ISN library to receive packets from the ISN card.

To run the pmon example, just type the following command in the "bin/pmon" directory.

- $ pmon pmon.isa0.config

When running the example, it displays statistics as shown in [Figure 17] and updates every 2 seconds.

```
$ ./pmon pmon.isa0.config
PMON:  InterStream IS4010-PMON-POS Card
       TX/RX status from 2006/02/13 22:34:32 to 2006/02/13 22:34:38
       Running time:  0 hour 0 min 6 sec

PMON: Packet statistics in applications(/dev/isa0)
     RX:         0 (       0M) packets,    0 kpps,     0 errs
                 0 (       0M) drops,      0 kpps,  0.0% dropped
    PKT:         0 (       0M) bytes,      0 kbps
    CAP:         0 (       0M) bytes,      0 kbps
                 0 (       0M) reads,      0 errs
```

[Figure 17] PMON example

As shown in [Figure 17], PMON displays the number of packets and packet-per-second by reading from the relevant device file. The “PKT” line shows byte level statistics of the packets in the link, while the “CAP” line shows byte level statistics of the packets captured by the ISPCAP card.

PCAP Library Examples

PCAP Example

PCAP example does same function as PMON example described above. The only difference is that it uses PCAP library instead of ISN library. The example is located in “bin/pcap” directory, and displays packet reception statistics by calling PCAP library.

To run the pcap example, just type the following command in the “bin/pcap” directory.

- $ pcap pcap.isa0.config

When running the example, it displays statistics as shown in [Figure 18] and updates every 2 seconds.

```
$ ./pcap pcap.isa0.config
PCAP:  InterStream IS4010-PCAP-POS Card
       TX/RX status from 2006/02/13 22:34:32 to 2006/02/13 22:34:38
       Running time:  0 hour 0 min 6 sec

PCAP: Packet statistics in applications(/dev/isa0)
     RX:         0 (       0M) packets,    0 kpps,     0 errs
                 0 (       0M) drops,      0 kpps,  0.0% dropped
    PKT:         0 (       0M) bytes,      0 kbps
    CAP:         0 (       0M) bytes,      0 kbps
                 0 (       0M) reads,      0 errs
```

[Figure 18] PCAP example

6 ISPCAP Troubleshooting

This chapter describes troubleshooting in installing and running the ISPCAP card.

Checkpoints for ISPCAP Card

The ISPCAP card has one 10Gbps POS or LAN Ethernet interface, and relevant LED-1 which shows status of the port. Before checking cable connection, please make sure that the ISPCAP card is installed in the system with the relevant driver provided by the package. Check followings after connecting cables to the ISPCAP card:

1. Make sure that the ISPCAP card is installed with the relevant driver, and the driver is running properly.
2. Connect cables to the ISPCAP port, and make sure the Link LED is green.
   [Troubleshooting] If the Link LED shows other than green, swap the position of the cables; that is, change “TX” and “RX” positions of the cables. If there is still the same problem, it is usually because either the peer system is not properly working or cables are at fault.
3. Check the link status of the port using “isconfig” command when Link LED shows green. All flags – LOS, LOF, OOF, APSBF, LRDI and LAIS – or – LINK, LF, RF, LOS, BER, SYNC – should be “ok”; otherwise it implies that the port is not connected properly.
   [Troubleshooting] It is possible for the POS PHY interface to configure some settings such as “SCRMBL”, “CRC”, etc. If the configured options do not match to the peer system, the above flags do not reveal “ok” status. Please refer to ISPNET driver options in this document to change the options. If there is still a problem even after reconfiguring the options, please contact the product supplier.
4. If there are no such problems as mentioned above, it implies that the port works properly. Check if “RX” LED blinks when the peer system

transmits packets. In addition, you can check the statistics by using the "isconfig" command.

Checkpoints for the System

Please refer to the followings, if your system can not boot up after installing the ISPCAP card or your system can not discover the card.

System Boot-up Failure after Installing the ISPCAP Card

Check followings if your system fails to boot up after installing the ISPCAP card:

1. Make sure that the ISPCAP card is installed in a PCI-X 64-bit 100/133 MHz or PCI-E 8xbus slot properly.

   [Troubleshooting] ISPCAP card works best in PCI-X 64-bit 100/133 MHz or PCI-E 8xbus interface slots. In other words, ISPCAP cards might not work properly if the cards are installed in 32-bit PCI slots and 66MHz 64-bit PCI or PCI-E 1xbus, 2xbus and 3xbus slots. Please make sure that your system supports the relevant PCI-X or PCI-E interfaces and the ISPCAP card is installed in the right slot.

2. Check if BIOS in your system has been updated with the most recent one.

   [Troubleshooting] Even if your system has the proper PCI-X or PCI-E slots for ISPCAP cards, there might be problems if the BIOS does not support the PCI-X or PCI-E interface. Please make sure BIOS in your system supports the PCI-X or PCI-E interface.

3. If you have another PCI-X or PCI-E slot, you can change from the old one to the new slot for the ISPCAP card to resolve the problem.

   [Troubleshooting] Some PCI-X or PCI-E slots can not work properly due to several system problems. In this case, you can change the slot to install the ISPCAP card, and test it again.

4. If you have other PCI cards in the system, you can test the ISPCAP card solely after removing all other PCI cards.

   [Troubleshooting] If the system works properly after removing all other PCI cards, it can be explained that there is a collision between the ISPCAP card and one of the removed PCI cards.

5. If you still have problems, it could be problems caused by either your system or the ISPCAP card.

   [Troubleshooting] You can install the ISPCAP card in another system,

or please contact the product supplier.

Driver Loading Failure after System Boot-up

Check followings if your system fails to load the driver for the ISPCAP card:

1. In the case of kernel panic or system down when loading the driver, please refer to section System boot-up failure after installing the ISPCAP card.
2. If your system can not discover the ISPCAP card when loading driver, you can use “lspci” command to check whether the ISPCAP card is successfully installed in the system. as follows:
   02:03.0 Ethernet controller: Xilinx Corporation: Unknown device 1000
3. If you still have problems, please contact the product supplier.

Linux Driver Loading Status

The command “lsmod” can be used to examine ISPCAP driver status. [Figure 19] shows an example of ISPCAP driver status.

```
$ lsmod
Module                  Size  Used by
is_driver              93540  2
hfsplus                93316  0
vfat                   30336  0
fat                    68636  1 vfat
...
```

[Figure 19] Example of ISPCAP driver status

Appendix A IS4010 Specification

Monitoring Interface Specifications

Feature	Specification
Interface	10 Gbps POS * 1 EA
Media type	9953.28 Mbps SMF 1300nm SC-type connector
Receiver Sensitivity	-15 to -1 dBm

Monitoring Network Specifications

Point-to-Point Protocol over SONET/SDH according to RFC 2615(1619)/1663

Supports packet based link layer protocols using byte synchronous HDLC framing

Perform self-synchronous POS data descrambling on the received STS-192c payloads

FCS validation for CRC-32 polynomials

Permits FCS stripping on the POS-PHY output data stream

Time Interface Specifications

Interface	GPS Time Interface Module * 1 EA
Connector	RJ45 Connector

PCI Bus Specifications

Feature	Specification
PCI-X clock	100/133 MHz (max)
PCI Data/Address	64 bit and 32 bit
PCI modes	Master/slave

Hardware Packet Processor Specifications

Full 10 Gbps line speed packet processing engine
Timestamp with 100 nano second resolution(optional)
Packet snapping size: 60 ~ 1536
Packet sampling :count-based sampling
Packet reception statistics

Physical Characteristics

Dimension	Measurement
Height	106.68 mm
Length	312.00 mm

Power Requirements

Specification	Measurement
Operating voltage	+5V, +3.3V, -12V (+-5%)
Power consumption	Less than 30 Watts

Environmental Specifications

Condition	Operating Specifications
Temperature	0 °C to 55 °C
Relative humidity	5 % to 85 %

Appendix B IS4110 Specification

Monitoring Interface Specifications

Feature	Specification
Interface	10.7 Gbps LAN * 1 EA
Media type	10.7 Gbps SMF 1310nm SC-type connector
Receiver Sensitivity	-15 to -1 dBm

Monitoring Network Specifications

Provides an IEEE 802.3ae 10 Gigabit MAC for Ethernet frame handling

Supports Ethernet 2.0, IEEE 802.3 LLC and IEEE 802.3 SNAP/LLC encoding formats including VLAN tagged frames

In the receive direction, supports 64B/66B decoding, frame delineation, frame intergrity(FCS and length) checks

Time Interface Specifications

Interface	GPS Time Interface Module * 1 EA
Connector	RJ45 Connector

PCI Bus Specifications

Feature	Specification
PCI-X clock	100/133 MHz (max)
PCI Data/Address	64 bit and 32 bit
PCI modes	Master/slave

Hardware Packet Processor Specifications

Full 10 Gbps line speed packet processing engine

Timestamp with 100 nano second resolution(optional)

Packet snapping size: 60 ~ 1536

Packet sampling :count-based sampling

Packet reception statistics

Physical Characteristics

Dimension	Measurement

Height	106.68 mm
Length	312.00 mm

Power Requirements

Specification	Measurement
Operating voltage	+5V, +3.3V, -12V (+-5%)
Power consumption	Less than 30 Watts

Environmental Specifications

Condition	Operating Specifications
Temperature	0 °C to 55 °C
Relative humidity	5 % to 85 %

Appendix C IS4010E Specification

Monitoring Interface Specifications

Feature	Specification
Interface	9.95 Gbps POS * 1 EA (XFP Optical Transceiver) Maximum link length of 10Km/40Km/80Km
Media type	9.95 Mbps SMF 1310nm Duplex LC connector
Receiver Sensitivity	-14 dBm to 0 dBm (10Km XFP Module) -16 dBm to -1 dBm (40Km XFP Module) -24 dBm to -7 dBm (80Km XFP Module)

Monitoring Network Specifications

Point-to-Point Protocol over SONET/SDH according to RFC 2615(1619)/1663

Supports packet based link layer protocols using byte synchronous HDLC framing

Perform self-synchronous POS data descrambling on the received STS-192c payloads

FCS validation for CRC-32 polynomials

Permits FCS stripping on the POS-PHY output data stream

Time Interface Specifications

Interface	GPS Time Interface Module * 1 EA
Connector	RJ45 Connector

PCI Bus Specifications

Feature	Specification
PCI-Express	8x

Hardware Packet Processor Specifications

Full 10 Gbps line speed packet processing engine

Timestamp with 100 nano second resolution(optional)

Packet snapping size: 60 ~ 1536

Packet sampling :count-based sampling

Packet reception statistics

Physical Characteristics

Dimension	Measurement
Height	106.50 mm
Length	182.65 mm

Power Requirements

Specification	Measurement
Operating voltage	+3.3V, +12V
Power consumption	Less than 22 Watts

Environmental Specifications

Condition	Operating Specifications
Temperature	0 °C to 55 °C
Relative humidity	5 % to 85 %

Appendix D IS4110E Specification

Monitoring Interface Specifications

Feature	Specification
Interface	10.7 Gbps LAN * 1 EA Maximum link length of 10Km/40Km/80Km
Media type	10.7 Gbps SMF XFP(10-Gigabit Small Form Factor Pluggable) 1310nm LC-Duplex
Receiver Sensitivity	-14 dBm to 0 dBm (10Km XFP Module) -16 dBm to -1 dBm (40Km XFP Module) -24 dBm to -7 dBm (80Km XFP Module)

Monitoring Network Specifications

Provides an IEEE 802.3ae 10 Gigabit MAC for Ethernet frame handling

Supports Ethernet 2.0, IEEE 802.3 LLC and IEEE 802.3 SNAP/LLC encoding formats including VLAN tagged frames

In the receive direction, supports 64B/66B decoding, frame delineation, frame intergrity(FCS and length) checks

Time Interface Specifications

Feature	Specification
PCI-Express	8x

PCI Bus Specifications

Feature	Specification
PCI-X clock	100/133 MHz (max)

Hardware Packet Processor Specifications

Full 10 Gbps line speed packet processing engine

Timestamp with 100 nano second resolution(optional)

Packet snapping size: 60 ~ 1536

Packet sampling :count-based sampling

Packet reception statistics

Physical Characteristics

Dimension	Measurement
Height	106.50 mm

Length	182.65 mm

Power Requirements

Specification	Measurement
Operating voltage	+3.3V, +12V
Power consumption	Less than 22 Watts

Environmental Specifications

Condition	Operating Specifications
Temperature	0 °C to 55 °C
Relative humidity	5 % to 85 %

Appendix E Technical Support

Sysmate INC. wholeheartedly assists you for technical support and customizations. You can get following services for technical support.

Online Technical Support

We offer 24-hour technical support in the Internet:

- Sysmate web-site technical support
- Sysmate e-mail technical support

Web-site Technical Support

You can obtain InterStream products and technical support information in the following web site:

http://www.sysmate.com

E-mail Technical Support

You can contact us for technical support by e-mail:

sales@sysmate.com

Technical Support from Product Suppliers

We have many partners who supply InterStream products. To get technical support from the product suppliers, you can ask them with following information:

- Product model number and serial number
- Product package software and hardware list
- Error messages (e.g. /var/log/messages or driver level error messages)
- System and InterStream card setting options

ISPCAP Card USER'S GUIDE

ISPCAP-USG(ENG)-200706-001

FCC NOTICE

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES.
OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITION:
(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
(2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDERSIRED OPERATION.

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 communication. 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 difference from that to which the receiver is connected.

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

NOTE : The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user’s authority to operate the equipment.

InterStream® PCAP

ISPCAP PCI CARD

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