LSI SAS控制器驱动报告Invalid Page原因分析

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1 现象

在使用LSISAS 1068E控制器的服务器上，内核中打印如下信息：

mptbase: ioc0: LogInfo(0x30030501): Originator={IOP}, Code={Invalid Page}, SubCode(0x0501) cb_idx mptctl_reply

在遇到这种打印信息时，不清楚原因，担心磁盘是否存在问题。本文详细分析错误日志来源及可能存在的原因。

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2 LSI Message Passing Interface

2.1 MPI接口概述

在LSI SAS控制器中，都是用了MPT接口，称为“Fusion-MPT Message Passing Interface”。MPI（Message Passing Interface, 消息传递接口）是一种标准的消息传递接口，是为统一不同产商的消息传递API而制订的工业标准，它主要为并行应用提供消息传递或者相关服务。其核心是MPI进程间的消息传递。MPI有完备的异步通信功能，可移植性强，易用性好。

LSI Logic的Fusion-MPT架构是新一代的高性能IO架构，它就是使用MPI来实现的。Fusion-MPT架构的几个主要构件包括：

- Fusion-MPT firmware架构
- FC与SCSI硬件架构
- 支持此架构的操作系统层驱动

Fusion-MPT架构使用统一的二进制操作系统驱动来支持目前的FC设备、SCSI设备以及将来的IO总线设备。

而MPI定义了LSI Logic 的所有通用架构芯片使用的主机接口，这些芯片包括FC929，FC929X，FC949X，SCSI 53C1020，SCSI 53C1030，SAS1064，SAS1068。它们使用高性能的ARM处理器，以减少主机的CPU占用率和I/O中断次数。采用Fusion-MPT架构，主机不需要知道具体的底层I/O总线结构就可以与目标设备进行通信。

Fusion-MPT架构之所以能够提供较高的性能，主要基于以下因素：

- 高性能的硬件，如ARM处理器，GigaBlaze收发器
- 高效率的I/O调度
- 智能的firmware设计，如流水线型的firmware架构

图1展示了Fusion-MPT的架构。

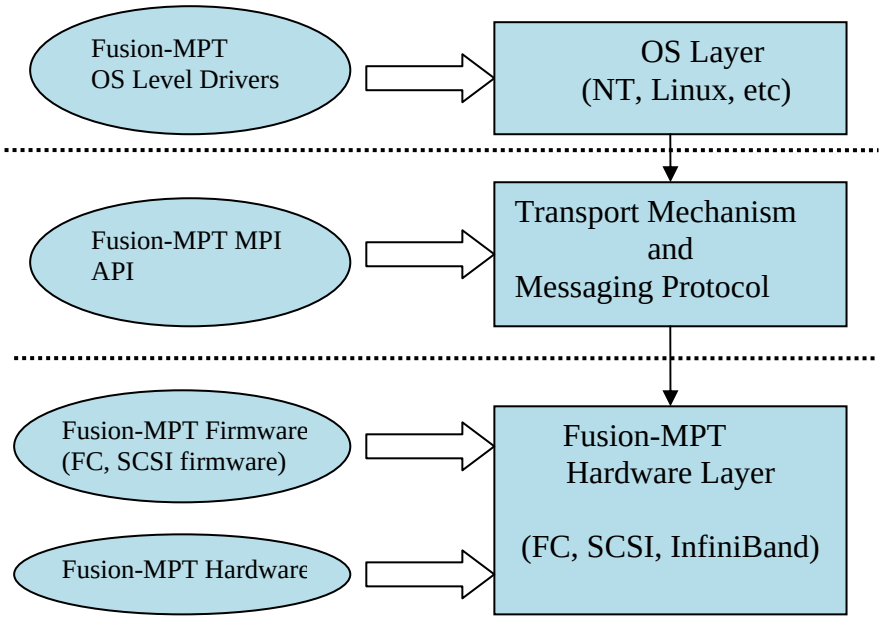

图1 Fusion-MPT 架构图

2.2 消息（message）格式与服务

2.2.1 消息功能

在系统和IOC（IO Controller）之间通信，可以通过MPI消息（message）机制。主机系统发送请求（request）消息给IOC，要求一个处理动作；IOC发送响应（reply）消息给主机。每一个消息都包含消息头和消息体，消息头中包含标识消息的相关信息。请求和响应消息，共享相同的功能代码集。

通过消息机制，我们可以初始化IOC控制器、升级Firmware/BIOS、关闭/使能硬盘、reset端口等。

下表是消息功能代码列表。

Function (MPI2_FUNCTION_)	Value	Description
IOC_INIT	0x02	Move the IOC to the Operational state.
IOC_FACTS	0x03	Obtain information about the IOC.
PORT_FACTS	0x05	Retrieve port-specific information about a port on the IOC.
PORT_ENABLE	0x06	Enable a port on the IOC.
EVENT_NOTIFICATION	0x07	Turn event notification on or off.
EVENT_ACK	0x08	Acknowledge the receipt of an event.
SEND_HOST_MESSAGE	0x31	Send a message to a host on another virtual function.
FW_DOWNLOAD	0x09	Download a firmware, BIOS, or related image to the IOC's nonvolatile storage.

FW_UPLOAD	0x12	Upload a firmware, BIOS, or related image from the IOC's nonvolatile storage.
SCSI_IO_REQUEST	0x00	Initiate a SCSI I/O on a target device.
SCSI_TASK_MGMT	0x01	Send a task management command to a target device.
SCSI_ENCLOSURE_PROCESSOR	0x18	Communicate with an SES device.
RAID_ACTION	0x15	Perform an action on or receive status information from an Integrated RAID volume.
RAID_SCSI_IO_PASSTHROUGH	0x16	Send an I/O to the hidden physical disk of Integrated RAID volume.
TARGET_CMD_BUF_BASE_POST	0x24	Post base address of command buffer pool to the IOC.
TARGET_CMD_BUF_LIST_POST	0x25	Repost an IoIndex to the IOC after it has been used.
TARGET_ASSIST	0x0B	Continue an I/O as a SCSI target.
TARGET_STATUS_SEND	0x0C	Send status for an I/O as a SCSI target.
TARGET_MODE_ABORT	0x0D	Abort a target mode request message.
SMP_PASSTHROUGH	0x1A	Send SMP functions to a SAS expander.
SATA_PASSTHROUGH	0x1C	Send SATA commands to an attached SATA device.
SAS_IO_UNIT_CONTROL	0x1B	Control the SAS IO Unit.
CONFIG	0x04	Access or modify operational parameters of the IOC.
TOOLBOX	0x17	Send a non-I/O tool request to the IOC.
DIAG_BUFFER_POST	0x1D	Post a diagnostic buffer to the IO Unit.
DIAG_RELEASE	0x1E	Request the IO Unit to release a diagnostic buffer.
RAID_ACCELERATOR	0x2C	Initiate a RAID Accelerator operation.
HOST_BASED_DISCOVERY_ ACTION	0x2F	Perform an action on a device instance during Host Based Discovery.
PWR_MGMT_CONTROL	0x30	Control power management features on the IOC.
MIN_PRODUCT_SPECIFIC	0xF0	Beginning of the product-specific range of function codes. Values 0xF0 to 0xFF are reserved for product-specific use. See product-specific documentation for details.
MAX_PRODUCT_SPECIFIC	0xFF	End of the product-specific range of function codes. Values 0xF0 to 0xFF are reserved for product-specific use. See product-specific documentation for details.

2.2.2 消息配置功能

通过消息机制，可以对IO单元进行配置，也可以进行不同的设置。主机（在OS中）可以使用配置请求消息（Configuration Request Message）来访问IOC的可操作参数。这些可操作参数分成多个逻辑组，称之为**Pages**。这些page根据不能操作范围，进而划分不同page类型，如IO Unit Pages、IOC Pages等，且通过不同的page号码访问。

所有的参数都必须基于page方式来访问。如果主机只想修改page中的某一个域，必须先page读出，再修改，最后回写。每个page都有属性，如只读等。

下表为配置请求消息（Configuration Request Message）格式。

31 24	23 16	15 8	7 0	Byte
Function	ChainOffset	SGLFlags	Action	0x00
MsgFlags	ExtPageType	ExtPageLength		0x04
Reserved		VF_ID	VP_ID	0x08
Reserved		ProxyVF_ID	Reserved	0x0C
Reserved				0x10
PageType	PageNumber	PageLength	PageVersion	0x14
PageAddress				0x18
PageBufferSGE				0x1C

下表为配置响应消息（Configuration Reply Message）格式。

31 24	23 16	15 8	7 0	Byte
Function	MsgLength	SGLFlags	Action	0x00
MsgFlags	ExtPageType	ExtPageLength		0x04
Reserved		VF_ID	VP_ID	0x08
IOCStatus		Reserved		0x0C
IOCLogInfo				0x10
PageType	PageNumber	PageLength	PageVersion	0x14

2.2.3 页面号与页面类型

在请求和响应消息格式中，PageNumber和PageType域的含义如下：

PageNumber [23:16]

The page number being accessed for the specified page type.

PageType [31:24]

The type of page being accessed. The two 4-bit fields are as follows:

页面类型如下表：

Bits	Description
[7:4]	PageAttribute The host should set this to zero or to match the value from the header of the specified page.
[3:0]	PageType (all values not listed are reserved) 0x0 = IO Unit pages 0x1 = IOC pages 0x2 = BIOS pages 0x8 = RAID Volume pages 0x9 = Manufacturing pages 0xA = RAID Physical Disk pages 0xF = Extended Page Type

3 LSI SAS告警信息分析

我们分析一下打印语句的来源“mptbase: ioc0: LogInfo(0x30030501): Originator={IOP}, Code={Invalid Page}, SubCode(0x0501) cb_idx mptctl_reply”。

在SAS控制器中断处理过程中，每次都会检查IOCStatus中是否有Log信息。若有Log信息，就打印出相关Log代码。

```
00447: static void
00448:  mpt_reply(MPT_ADAPTER *ioc, u32 pa)
00449: {
00450:        MPT_FRAME_HDR    *mf;
00451:        MPT_FRAME_HDR    *mr;
00452:        u16              req_idx;
00453:        u8               cb_idx;
00454:        int              freeme;
  ... ...
00481:        /* Check/ log IOC log info
00482:        */
00483:        ioc_stat = le16_to_cpu(mr->u.reply.IOCStatus);
00484:        if (ioc_stat & MPI_IOCSTATUS_FLAG_LOG_INFO_AVAILABLE) {
00485:              u32  log_info = le32_to_cpu(mr->u.reply.IOCLogInfo);
00486:              if (ioc->bus_type == FC)
00487:                    mpt_fc_log_info(ioc, log_info);
00488:              else if (ioc->bus_type == SPI)
00489:                    mpt_spi_log_info(ioc, log_info);
00490:              else if (ioc->bus_type == SAS)
00491:                    mpt_sas_log_info(ioc, log_info, cb_idx);
00492:        }
  ... ..
```

“LogInfo(0x30030501): Originator={IOP}, Code={Invalid Page}, SubCode(0x0501)”，这段语句来源驱动模块mptbase，在文件drivers/message/fusion/mptbase.c，函数mpt_sas_log_info( )中打印。

函数完整源码如下：

```
08017: mpt_sas_log_info(MPT_ADAPTER *ioc, u32 log_info, u8
cb_idx)
08018: {
08019: union loginfo_type {
08020:         u32  loginfo;
08021:         struct {
08022:                 u32  subcode:16;
08023:                 u32  code:8;
08024:                 u32  originator:4;
08025:                 u32  bus_type:4;
08026:         }dw;
08027: };
08028:         union loginfo_type sas_loginfo;
08029:         char *originator_desc = NULL;
08030:         char *code_desc = NULL;
08031:         char *sub_code_desc = NULL;
08032:
08033:         sas_loginfo.loginfo = log_info;
08034:         if ((sas_loginfo.dw.bus_type != 3 /*SAS*/) &&
08035:            (sas_loginfo.dw.originator < ARRAY_SIZE(originator_str )))
08036:                 return;
08037:
08038:         originator_desc = originator_str [sas_loginfo.dw.originator];
08039:
08040:         switch (sas_loginfo.dw.originator) {
08041:
08042:                 case 0:   /* IOP */
08043:                         if (sas_loginfo.dw.code <
08044:                            ARRAY_SIZE(iop_code_str ))
08045:                                 code_desc = iop_code_str [sas_loginfo.dw.code];
08046:                         break;
08047:                 case 1:   /* PL */
08048:                         if (sas_loginfo.dw.code <
08049:                            ARRAY_SIZE(pl_code_str ))
08050:                                 code_desc = pl_code_str [sas_loginfo.dw.code];
08051:                         break;
08052:                 case 2:   /* IR */
08053:                         if (sas_loginfo.dw.code >=
08054:                            ARRAY_SIZE(ir_code_str ))
08055:                                 break;
08056:                         code_desc = ir_code_str [sas_loginfo.dw.code];
08057:                         if (sas_loginfo.dw.subcode >=
08058:                            ARRAY_SIZE(raid_sub_code_str ))
08059:                                 break;
08060:                         if (sas_loginfo.dw.code == 0)
08061:                                 sub_code_desc =
08062:                                    raid_sub_code_str [sas_loginfo.dw.subcode];
08063:                         break;
08064:                 default:
```

```
08065:                  return;
08066:          } ?   end switch sas_loginfo.dw.origin... ?
08067:
08068:          if (sub_code_desc ! = NULL)
08069:                  printk(MYIOC_s_INFO_FMT
08070:                          "LogInfo(0x%08x): Originator={%s}, Code={%s},"
08071:                          " SubCode={%s} cb_idx %s\n",
08072:                          ioc- >name, log_info, originator_desc, code_desc,
08073:                          sub_code_desc, MptCallbacksName[cb_idx]);
08074:          else if (code_desc ! = NULL)
08075:                  printk(MYIOC_s_INFO_FMT
08076:                          "LogInfo(0x%08x): Originator={%s}, Code={%s},"
08077:                          " SubCode(0x%04x) cb_idx %s\n",
08078:                          ioc- >name, log_info, originator_desc, code_desc,
08079:                          sas_loginfo.dw.subcode, MptCallbacksName[cb_idx]);
08080:          else
08081:                  printk(MYIOC_s_INFO_FMT
08082:                          "LogInfo(0x%08x): Originator={%s}, Code=(0x%02x),"
08083:                          " SubCode(0x%04x) cb_idx %s\n",
08084:                          ioc- >name, log_info, originator_desc,
08085:                          sas_loginfo.dw.code, sas_loginfo.dw.subcode,
08086:                          MptCallbacksName[cb_idx]);
08087: } ?   end mpt_sas_log_info ?
```

3.1 响应消息中IOCLogInfo与IOCStatus

现在来分析LogInfo、Originator、Code和SubCode的含义。

通用响应消息（Reply Message）格式如下：

31 24	23 16	15 8	7 0	Byte
Function	MsgLength	Function Dependent		0x00
MsgFlags	Function Dependent			0x04
Reserved		VF_ID	VP_ID	0x08
IOCStatus		Function Dependent		0x0C
IOCLogInfo				0x10

在响应消息中，有“IOCLogInfo”和“IOCStatus”两个域。

3.1.1 IOCStatus

响应消息中的IOCStatus含义为：

IOCStatus [31:16]

This field provides a status value from the IOC. The host driver maps this value to an operating system status.

当IOCStatus bit 15值为1时，表明IOC中有Log日志。

Bits	Description
15	Log Information Available 0 = There is no data in the IOCLogInfo field of this reply message. 1 = The IOCLogInfo field contains data that the host driver may wish to place in the system log.
[14:0]	Status Completion status of the requested operation. The host driver maps this value to an operating system status.

响应消息处理函数mpt_reply（）中484行就是检查是否有日志。

```
00484:  if (ioc_stat & MPI_IOCSTATUS_FLAG_LOG_INFO_AVAILABLE)
```

IOCStatus部分代码的含义如下：

IOCStatus (MPI2_IOCSTATUS_)	Value	Description
SUCCESS	0x0000	The command completed successfully from the IOC standpoint.
INVALID_FUNCTION	0x0001	This function is not supported by the IOC or the function code is undefined.
BUSY	0x0002	The IOC cannot process the request at this time.
INVALID_SGL	0x0003	The SGE is not supported or understood.
INTERNAL_ERROR	0x0004	An internal IOC hardware problem exists, or a processing error has occurred.
INVALID_VPID	0x0005	The value provided for the virtual port ID is invalid.
INSUFFICIENT_RESOURCES	0x0006	The IOC has insufficient resources to process the request at this time.
INVALID_FIELD	0x0007	A field in the message has an invalid value.
INVALID_STATE	0x0008	The IOC is in the wrong state to process this message.
OP_STATE_NOT_SUPPORTED	0x0009	The IOC cannot go to the Operational state. Request and reply queues are not functional, but minimal non-I/O functionality is available.
CONFIG_INVALID_ACTION	0x0020	The configuration action is not supported.
CONFIG_INVALID_TYPE	0x0021	The configuration page type is not supported.
CONFIG_INVALID_PAGE	0x0022	The configuration page is not supported.
CONFIG_INVALID_DATA	0x0023	There is an incorrect field setting within the configuration data during a write operation, or there are no valid page values available for a read operation.
CONFIG_NO_DEFAULTS	0x0024	The IOC cannot set defaults for this page.

3.1.2 IOCLogInfo

驱动代码打印的LogInfo(0x30030501)，就是IOCLogInfo域记录的值。

IOCLogInfo含义如下：

IOCLogInfo [31:0]

An implementation-specific value that supplements the IOC status.Typically, the information should not be

mapped to an operating system status value. Instead, it should be logged by the host driver.

Bits	Description
[31:28]	Log Info Type (based on IOC type) 0x0 = No information 0x1 = SCSI IOC information available 0x2 = Fibre Channel IOC information available 0x3 = SAS IOC information available 0x4 = iSCSI IOC information available All other values are reserved.
[27:0]	Log Data Product-specific log data value. See product-specific documentation for details.

系统报告的IOCLogInfo值为0x30030501，[31:28]的值为0x3，因此是“SAS IOC information available”。虽然机器上插的硬盘可能是SATA，但IOC控制器出来的接口是SAS。SAS与SATA接口是兼容的。

对于LSI SAS1068E设备而言， IOCLogInfo的解析为

[31:28] MPI_IOCLOGINFO_TYPE_SAS (3)

[27:24] IOC_LOGINFO_ORIGINATOR: 0 = IOP, 1 = PL, 2 = IR

[23:16] LOGINFO_CODE

[15:0] LOGINFO_CODE Specific

相应的驱动使用数据结构定义如下：

```
08019: union loginfo_type {
08020:         u32  loginfo;
08021:         struct {
08022:                 u32  subcode:16;
08023:                 u32  code:8;
08024:                 u32  originator:4;
08025:                 u32  bus_type:4;
08026:         }dw;
08027: };
```

3.2 Log消息来源

Log信息来源有三个地方：IOP（IO Processor）、PL（Protocol Layer）和IR（Integrated RAID）。在IOCLogInfo中的Originator字段（见驱动代码mpt_sas_log_info（）中的842、847、852行），

0x0：来源为IOP

0x1：来源为PL

0x2：来源为IR

```
08042:                 case 0:   /* IOP */
```

```
08047:          case 1:   /* PL */
08052:          case 2:   /* IR */
```

LogInfo(0x30030501)中Originator的值为0x0，表示来源为“IOP”。

3.3 code与subcode

根据IOCLogInfo的职位0x30030501，解析到的Code值为0x3。根据前面，可以看到消息来源是IOP，IOP中的[23:0]值含义如下。

Bits [23:0]	Message Code	Explanation
0x00010000	IOP_LOGINFO_CODE_INVALID_SAS_ADDRESS	Invalid SAS Address detected in Manufacturing Page 5.
0x00020000	IOP_LOGINFO_CODE_NOT_USED2	Not used.
0x00030000	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE	Not used.
0x00030100	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_RT	Route table entry not found.
0x00030200	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_PN	Invalid page number.
0x00030300	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_FORM	Invalid FORM.
0x00030400	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_PT	Invalid page type.
0x00030500	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_DNM	Device not mapped.
0x00030600	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_PERSIST	Persistent page not found.
0x00030700	IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_DEFAULT	Default page not found.
0x0003E000	IOP_LOGINFO_CODE_FWUPLOAD_NO_FLASH_AVAILABLE	Tried to upload from flash, but there is none.
0x0003E001	IOP_LOGINFO_CODE_FWUPLOAD_UNKNOWN_IMAGE_TYPE	ImageType field contents were invalid.
0x0003E002	IOP_LOGINFO_CODE_FWUPLOAD_WRONG_IMAGE_SIZE	ImageSize field in TCSGE was bad/offset in MfgPg 4 was wrong.
0x0003E003	IOP_LOGINFO_CODE_FWUPLOAD_ENTIRE_FLASH_UPLOAD_FAILED	Error occurred while attempting to upload the entire flash.
0x0003E004	IOP_LOGINFO_CODE_FWUPLOAD_REGION_UPLOAD_FAILED	Error occurred while attempting to upload single flash region.
0x0003E005	IOP_LOGINFO_CODE_FWUPLOAD_DMA_FAILURE	Problem occurred while DMAing FW to host memory.
0x00040000	IOP_LOGINFO_CODE_DIAG_MSG_ERROR	Diagnostic Buffer error detected.
0x00050000	IOP_LOGINFO_CODE_TASK_TERMINATED	I/O has been terminated as a result of Task Management. This Task Management can also be generated internally by the firmware.
0x00060001	IOP_LOGINFO_CODE_ENCL_MGMT_READ_ACTION_ERROR	Read action not supported for SEP message.
0x00060002	IOP_LOGINFO_CODE_ENCL_MGMT_INVALID_BUS_ID_ERROR	Invalid Bus ID in SEP message.
0x00070001	IOP_LOGINFO_CODE_TARGET_ASSIST_TERMINATED	Target Assist is terminated, e.g., due to bus reset occurring just as this command came in.

根据IOP响应消息0x30030501，对应的值为“IOP_LOGINFO_CODE_CONFIG_INVALID_PAGE_DNM”，即表示“**Device not mapped**”。

有个问题，为什么驱动中报告的是“Invalid Page”呢？先来看一下驱动代码中对相关Code定义，发现Code中0x3就表示“Invalid Page”，而没有像芯片手册上描述完整。

```
07865: /* strings for sas loginfo */
07866:      static char *originator_str[] = {
07867:           "IOP",                          /* 00h */
07868:           "PL",                        /* 01h */
07869:           "IR"                         /* 02h */
07870:      };
07871:      static char *iop_code_str[] = {
07872:           NULL,                           /* 00h */
07873:           "Invalid SAS Address",               /* 01h */
07874:           NULL,                           /* 02h */
07875:           "Invalid Page",                      /* 03h */
07876:           "Diag Message Error",                /* 04h */
07877:           "Task Terminated",              /* 05h */
07878:           "Enclosure Management",                   /* 06h */
07879:           "Target Mode"                   /* 07h */
07880:      };
```

4 根因分析

事实上，“mptbase: ioc0: LogInfo(0x30030501): Originator={IOP}, Code={Invalid Page}, SubCode(0x0501) cb_idx mptctl_reply”系统打印，并不是系统运行过程中打印的语句，而是运**行LSI提供的工具lsiutil**后产生的，或者类似lsiutil工具所使用的Configuration Page（消息配置）功能（见2.2.2节）。

图2是lsiutil 1.60版本运行结果（diskinfo是根据lsiutil 1.60版本适当修改而来）。运行结果中，发现有两块硬盘在系统中没有对应的OS盘符，因此在lsiutil工具使用消息配置功能，扫描硬盘过程中，IOCLogInfo记录了“Device not mapped”。

```
[root@hadoop-02 diskinfo_1.60.07hw]# ./diskinfo

=========IOCPort:0==========
   Target SerialNum       PhyNum    OSDeviceName
   ----------------------------------------
     1    9QJ7GZJS            1    /dev/sdb
    10    9WM4DDQ5           10    --------
    11    9WM2QKBT           11    --------
    15    --------           24    --------
[root@hadoop-02 diskinfo_1.60.07hw]#
```

图2 lsiutil 1.60版本运行结果

但我们使用lsiutil 1.67版本做同样操作时，内核中并不会有任何异常打印，更不会报告“mptbase: ioc0: LogInfo(0x30030501): Originator={IOP}, Code={Invalid Page}, SubCode(0x0501) cb_idx mptctl_reply”。图3是lsiutil 1.67版本运行结果。

```
/proc/mpt/ioc0 is SCSI host 4

 B___T___L  Type       Operating System Device Name
 0   1   0  Disk       /dev/sda    [4:0:0:0]
 0  10   0  Disk       /dev/sdb    [4:0:1:0]
 0  11   0  Disk       /dev/sdc    [4:0:2:0]
 0  15   0  EnclServ

Main menu, select an option:  [1-99 or e/p/w or 0 to quit]
```

图3 lsiutil 1.67版本运行结果

那么系统中另外两块硬盘到底是否有OS盘符呢？通过fdisk命令，发现确实有三个盘符，与lsiutil 1.67版本显示结果一致。图4是系统OS盘符。

```
[root@hadoop-02 diskinfo_1.60.07hw]# fdisk -l |grep Disk
Disk /dev/sdc doesn't contain a valid partition table
Disk /dev/sdb doesn't contain a valid partition table
Disk /dev/sdc: 2000.4 GB, 2000398934016 bytes
Disk identifier: 0x00000000
Disk /dev/sdb: 2000.4 GB, 2000398934016 bytes
Disk identifier: 0x00000000
Disk /dev/sda: 1000.2 GB, 1000204886016 bytes
Disk identifier: 0x0005d668
[root@hadoop-02 diskinfo_1.60.07hw]#
```

图4 系统磁盘情况

从上面分析可以看出，也就是驱动报告“Invalid Page”的原因在于：**提供消息配置功能的工具版本较低，如lsiutil，配置信息不兼容，导致控制器记录Log。**

用户更关心的问题是：此时硬盘有没有问题？答案是：不一定。这个日志信息不能作为判断硬盘是否故障的条件。

5 附录

本文分析的是IOC日志信息来源于IOP的Code解析，对于来源于PL和IR的Code解析，请参考下面列表。

5.1 IOCLogInfo Codes for PL Code Segment

Bits [23:0]	Message Code	Explanation
0x00010000	PL_LOGINFO_CODE_OPEN_FAILURE	Failed to open connection to device. Low order byte contains the reason code and could be one of the following: • 0x01 – No destination timeout • 0x02 – Pathway blocked • 0x03 – Reserved Continue 0 • 0x04 – Reserved Continue 1 • 0x05 – Reserved Initialize 0 • 0x06 – Reserved Initialize 1 • 0x07 – Reserved Stop 0 • 0x08 – Reserved Stop 1 • 0x09 – Retry • 0x0A – Break • 0x0B – Unused • 0x0C – Timeout expired • 0x0D – Unused • 0x0E – Device Table access failed • 0x0F – 0x10: Unused • 0x11 – Bad destination • 0x12 – Rate not supported • 0x13 – Protocol not supported • 0x14 – Reserved Abandon 0 • 0x15 – Reserved Abandon 1 • 0x16 – Reserved Abandon 2 • 0x17 – Reserved Abandon 3 • 0x18 – STP Resource busy • 0x19 – Wrong destination • 0x1B – Pathway blocked, retry timeout • 0x1C – Arbitration Wait Timer maxed
0x00020000	PL_LOGINFO_CODE_INVALID_SGL	Not used.
0x00030000	PL_LOGINFO_CODE_WRONG_REL_OFF_OR_FRAME_LENGTH	Not used.
0x00040000	PL_LOGINFO_CODE_FRAME_XFER_ERROR	Error detected during frame transfer. See subcode for more detail.
0x00050000	PL_LOGINFO_CODE_TX_FM_CONNECTED_LOW	Not used.
0x00060000	PL_LOGINFO_CODE_SATA_NON_NCQ_RW_ERR_BIT_SET	Error detected on SATA non-NCQ drive automated read writes. Failing the command to host, do some hardware cleanup: issue target reset using internal task management. **Note:** Since this is a non-NCQ drive, hardware should only be using tag 0 for the device, and I/O to the device should be single-threaded.
0x00070000	PL_LOGINFO_CODE_SATA_READ_LOG_RECEIVE_DATA_ERR	Not used.

0x00080000	PL_LOGINFO_CODE_SATA_NCQ_FAIL_ALL_CMDS_AFTR_ERR	An error occurred on a SATA NCQ drive; Finishing all of the outstanding I/Os to the device, the drive will abort the outstanding I/Os.
0x00090000	PL_LOGINFO_CODE_SATA_ERR_IN_RCV_SET_DEV_BIT_FIS	Not used.
0x000A0000	PL_LOGINFO_CODE_RX_FM_INVALID_MESSAGE	Not used.
0x000B0000	PL_LOGINFO_CODE_RX_CTX_MESSAGE_VALID_ERROR	Not used.
0x000C0000	PL_LOGINFO_CODE_RX_FM_CURRENT_FRAME_ERROR	Not used.
0x000D0000	PL_LOGINFO_CODE_SATA_LINK_DOWN	Not used.
0x000E0000	PL_LOGINFO_CODE_DISCOVERY_SATA_INIT_W_IOS	Not used.
0x000F0000	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE	Not used.
0x000F0001	PL_LOGINFO_CODE_CONFIG_PL_NOT_INITIALIZED	Error reading the Config Page: it is not initialized.
0x000F0100	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_PT	Invalid page type.
0x000F0200	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_NUM_PHYS	Invalid number of phys.
0x000F0300	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_NOT_IMP	Case not handled.
0x000F0400	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_NO_DEV	No device found.
0x000F0500	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_FORM	Invalid FORM.
0x000F0600	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_PHY	Invalid Phy.
0x000F0700	PL_LOGINFO_CODE_CONFIG_INVALID_PAGE_NO_OWNER	No owner found.
0x00100000	PL_LOGINFO_CODE_DSCVRY_SATA_INIT_TIMEOUT	Not used.
0x00110000	PL_LOGINFO_CODE_RESET	Internal Task Management issued to reset the device. See subcode for more detail.
0x00120000	PL_LOGINFO_CODE_ABORT	Abort the command. See subcode for more detail.
0x00130000	PL_LOGINFO_CODE_IO_NOT_YET_EXECUTED	I/O Aborted (host issued task management) before sent to target.
0x00140000	PL_LOGINFO_CODE_IO_EXECUTED	I/O Aborted (host issued task management) after sent to target.
0x00150000	PL_LOGINFO_CODE_PERS_RESV_OUT_NOT_AFFIL_OWNER	Finished persistent reserve out command, but there is already an outstanding affiliation.
0x00160000	PL_LOGINFO_CODE_OPEN_TXDMA_ABORT	—
0x00170000	PL_LOGINFO_CODE_IO_DEVICE_MISSING_DELAY_RETRY	Device is missing and device missing delay timer option is enabled. When the timer starts, an internal task management is sent to clean up the pending I/Os, the I/Os are returned with this log info, and the host should retry these I/Os. This log info is also sent when the I/O reply timer expires.
0x00180000	PL_LOGINFO_CODE_IO_CANCELLED_DUE_TO_R_ERR	I/O cancelled due to CRC error.
0x00181000	PL_LOGINFO_CODE_IO_CANCELLED_DUE_TO_CRC_ERR	I/O cancelled due to CRC error.

0x00000100	PL_LOGINFO_SUB_CODE_OPEN_FAILURE	Failed to open connection for reasons other than the ones mentioned by the subcodes below.
0x00000101	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_NO_DEST_TIMEOUT	Failed to open connection with error Open Reject (No Destination). Retried for 50 milliseconds.
0x00000102	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_SATA_NEG_RATE_2HI	Failed to open connection due to negotiated rate on link is higher than the SATA device. Retried for 50 milliseconds.
0x00000103	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_RATE_NOT_SUPPORTED	Failed to open connection due to rate not supported. Retried for 50 milliseconds.
0x00000104	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_BREAK_RECEIVED	Failed to open connection due to break received. Retried for 50 milliseconds.
0x00000114	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_ZONE_VIOLATION PL_LOGINFO_SUB_CODE_OPEN_FAILURE_ABANDON0	Failed to open connection due to Zone violation, used in SAS2 firmware. Failed to open connection used in SAS1 firmware.
0x00000115	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_ABANDON1	Failed to open connection. yet to assign a specific name and currently it is reserved.
0x00000116	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_ABANDON2	Failed to open connection. yet to assign a specific name and currently it is reserved.
0x00000117	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_ABANDON3	Failed to open connection. yet to assign a specific name and currently it is reserved.
0x0000011A	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_ORR_TIMEOUT	Failed to open connection with error. Open Reject Retry, and retry count exceeded. Retried for 1.25 seconds.
0x0000011B	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_PATHWAY_BLOCKED	Failed to open connection, retry count for pathway blocked exceeded. Retried for 50 milliseconds.
0x0000011C	PL_LOGINFO_SUB_CODE_OPEN_FAILURE_AWT_MAXED	Failed to open connection, arbitration wait timer exceeded. Retried for 50 milliseconds.
0x00000120	PL_LOGINFO_SUB_CODE_TARGET_BUS_RESET	Target mode aborting I/O after receiving hard reset. This can also be due to open fail no destination or open reject retry and retry count has been exceeded (1.25 seconds).
0x00000130	PL_LOGINFO_SUB_CODE_TRANSPORT_LAYER	Target mode aborts the I/O due to bad DMA detected in receive operation (for example: Invalid SGL).
0x00000131	PL_LOGINFO_SUB_CODE_TRANSPORT_LAYER_1	Target mode aborts the I/O due to frame transfer error or wrong relative offset detected.
0x00000132	PL_LOGINFO_SUB_CODE_TRANSPORT_LAYER_2	Target mode aborts the I/O due to bad DMA detected in send operation (for example: Invalid SGL).
0x00000133	PL_LOGINFO_SUB_CODE_TRANSPORT_LAYER_3	Target mode aborts the I/O after receiving frame with wrong frame length, wrong relative offset, or zero write data length in XFER_RDY.
0x00000134	PL_LOGINFO_SUB_CODE_TRANSPORT_LAYER_4	Target mode detected open connection and received BREAK. Aborting the I/O.
0x00000135	PL_LOGINFO_SUB_CODE_TRANSPORT_LAYER_5	Target mode aborted the I/O due to either of the following: • Received XFER_RDY or response frame before the data transfer has completed. • Retry count has been exceeded.
0x00000140	PL_LOGINFO_SUB_CODE_PORT_LAYER	Error detected in target mode I/O (non-data transfer). Aborting the I/O.
0x00000141	PL_LOGINFO_SUB_CODE_PORT_LAYER_1	Error detected in target mode data transfer I/O. Aborting the I/O.
0x00000142	PL_LOGINFO_SUB_CODE_PORT_LAYER_2	Error detected in transfer ready or response frame. Aborting the I/O.

0x00000143	PL_LOGINFO_SUB_CODE_PORT_LAYER_3	Target mode open failure due to no destination, rate not supported, or break received. Aborting the I/O.
0x00000200	PL_LOGINFO_SUB_CODE_INVALID_SGL	Aborting the command due to invalid SGL detected. This may be caused by mismatch between amount of data moved and length requested.
0x00000300	PL_LOGINFO_SUB_CODE_WRONG_REL_OFF_OR_FRAME_LENGTH	Firmware detected unexpected relative offset or wrong frame length. Aborting the command.
0x00000400	PL_LOGINFO_SUB_CODE_FRAME_XFER_ERROR	Frame transfer error occurred on data frame. This condition occurs if: • Connected becomes inactive during frame transmission. • NAK is received for a frame transmission. • ACK is not received before Connected goes inactive. • XRDY received to transmit DMA and the command is queued. The I/O is then aborted if it is not already in the abort list with an internal task management. This log info is then sent to the host.
0x00000500	PL_LOGINFO_SUB_CODE_TX_FM_CONNECTED_LOW	Firmware tries to send query task to determine if the target actually got the command frame. This may happen if an open connection from host does not receive ACK/NAK, possibly due to BREAK received. Upon completion of the task, the I/O will be aborted if it was not found or will be permitted to continue if it was found on the target.
0x00000600	PL_LOGINFO_SUB_CODE_SATA_NON_NCQ_RW_ERR_BIT_SET	Not used.
0x00000700	PL_LOGINFO_SUB_CODE_SATA_READ_LOG_RECEIVE_DATA_ERR	SATA Read Log Ext command failed. Following are the possible causes: • PIO Setup FIS received with SATA EndStatus bit 0 is set (0x01). • Device to Host register FIS Status field bits 5 and 0 are set (0x21). Target will be reset.
0x00000800	PL_LOGINFO_SUB_CODE_SATA_NCQ_FAIL_ALL_CMDS_AFTR_ERR	Not used.
0x00000900	PL_LOGINFO_SUB_CODE_SATA_ERR_IN_RCV_SET_DEV_BIT_FIS	SATA Read Log Ext command arrived in an invalid frame type, not Device to Host Set Device Bits FIS. Target will be reset.
0x00000A00	PL_LOGINFO_SUB_CODE_RX_FM_INVALID_MESSAGE	XFER_RDY or RESPONSE received and the Rx Hardware indicates the tag / MID is not valid. Target will be reset.
0x00000B00	PL_LOGINFO_SUB_CODE_RX_CTX_MESSAGE_VALID_ERROR	DATA frame was received with invalid tag/MID. The SAS Specification says that the frame shall be discarded, and firmware aborts the command with that tag. Since firmware does not recognize the tag and which LUN it is for, the target will be reset.
0x00000B01	PL_LOGINFO_SUB_CODE_RX_CTX_MESSAGE_INVALID_ERROR	I/O aborted since the valid frame is received and the corresponding TAG is not validated.
0x00000C00	PL_LOGINFO_SUB_CODE_RX_FM_CURRENT_FRAME_ERROR	This can happen if the target sends a Response or XFER_RDY frame too early, while the data transfer is still in progress. It can also happen in the ACK/NAK timeout case. Firmware will reset the device.
0x00000D00	PL_LOGINFO_SUB_CODE_SATA_LINK_DOWN	Resetting target because SATA link went down.
0x00000E00	PL_LOGINFO_SUB_CODE_DISCOVERY_SATA_INIT_W_IOS	SATA Init aborted outstanding I/Os to the device. This device may have changed or may have failed SATA Init previously. Device will be reset.

0x00000E01	PL_LOGINFO_SUB_CODE_DISCOVERY_REMOTE_SEP_RESET	Remote SEP needs to be reset.
0x00000F00	PL_LOGINFO_SUB_CODE_SECOND_OPEN	Not used.
0x00001000	PL_LOGINFO_SUB_CODE_DSCVRY_SATA_INIT_TIMEOUT	Device failed SATA Init command. Aside from device failure, this can also be due to the link going down during SATA Init. Internal Task Management will then reset the link and retry SATA Init.
0x00002000	PL_LOGINFO_SUB_CODE_BREAK_ON_SATA_CONNECTION	Not used.
0x00003000	PL_LOGINFO_SUB_CODE_BREAK_ON_STUCK_LINK	FW sends an internal task management reset to the link, if connection is already established when the link is stuck.
0x00004000	PL_LOGINFO_SUB_CODE_BREAK_ON_STUCK_LINK_AIP	FW sends an internal task management reset to the link, if connection has not been established.
0x00005000	PL_LOGINFO_SUB_CODE_BREAK_ON_INCOMPLETE_BREAK_RCVD	—
0x00006000	PL_LOGINFO_SUB_CODE_BREAK_ON_STUCK_TX_DMA	I/O aborted since this transport has been stalled for 2.5 seconds.
0x00007000	PL_LOGINFO_SUB_CODE_INVALID_SATA_TAG_ERROR	An FIS that contained a tag that did not correspond to one of the device's outstanding tags.
0x00200000	PL_LOGINFO_CODE_ENCL_MGMT_SMP_FRAME_FAILURE	Cannot get SMP frame.
0x00200010	PL_LOGINFO_CODE_ENCL_MGMT_SMP_READ_ERROR	Error occurred on SMP Read.
0x00200020	PL_LOGINFO_CODE_ENCL_MGMT_SMP_WRITE_ERROR	Error occurred on SMP Write.
0x00200040	PL_LOGINFO_CODE_ENCL_MGMT_NOT_SUPPORTED_ON_ENCL	Enclosure Management services not available for this WWID.
0x00200050	PL_LOGINFO_CODE_ENCL_MGMT_ADDR_MODE_NOT_SUPPORTED	Address Mode not supported.
0x00200060	PL_LOGINFO_CODE_ENCL_MGMT_BAD_SLOT_NUM	Invalid slot number in SEP Message.
0x00200070	PL_LOGINFO_CODE_ENCL_MGMT_SGPIO_NOT_PRESENT	SGPIO not present/enabled.
0x00200080	PL_LOGINFO_CODE_ENCL_MGMT_GPIO_NOT_CONFIGURED	GPIO not configured.
0x00200090	PL_LOGINFO_CODE_ENCL_MGMT_GPIO_FRAME_ERROR	GPIO cannot allocate a frame.
0x002000A0	PL_LOGINFO_CODE_ENCL_MGMT_GPIO_CONFIG_PAGE_ERROR	GPIO failed config page request.
0x002000B0	PL_LOGINFO_CODE_ENCL_MGMT_SES_FRAME_ALLOC_ERROR	Cannot get frame for SES command.
0x002000C0	PL_LOGINFO_CODE_ENCL_MGMT_SES_IO_ERROR	I/O execution error.
0x002000D0	PL_LOGINFO_CODE_ENCL_MGMT_SES_RETRIES_EXHAUSTED	SEP I/O retries exhausted.
0x002000E0	PL_LOGINFO_CODE_ENCL_MGMT_SMP_FRAME_ALLOC_ERROR	Cannot get frame for SMP command.

0x00200100	PL_LOGINFO_DA_SEP_NOT_PRESENT	SEP not present when message was received.
0x00200101	PL_LOGINFO_DA_SEP_SINGLE_THREAD_ERROR	Can only accept one message at a time.
0x00200102	PL_LOGINFO_DA_SEP_ISTWI_INTR_IN_IDLE_STATE	ISTWI interrupt received while in IDLE state.
0x00200103	PL_LOGINFO_DA_SEP_RECEIVED_NACK_FROM_SLAVE	SEP NACK'd; it is busy.
0x00200104	PL_LOGINFO_DA_SEP_DID_NOT_RECEIVE_ACK	SEP did not receive. ACK (Last Rcvd Bit = 1).
0x00200105	PL_LOGINFO_DA_SEP_BAD_STATUS_HDR_CHKSUM	SEP stopped or sent bad chksum in Hdr.
0x00200106	PL_LOGINFO_DA_SEP_STOP_ON_DATA	SEP stopped while transferring data.
0x00200107	PL_LOGINFO_DA_SEP_STOP_ON_SENSE_DATA	SEP stopped while transferring sense data.
0x00200108	PL_LOGINFO_DA_SEP_UNSUPPORTED_SCSI_STATUS_1	SEP returned unknown SCSI status.
0x00200109	PL_LOGINFO_DA_SEP_UNSUPPORTED_SCSI_STATUS_2	SEP returned unknown SCSI status.
0x00200110	PL_LOGINFO_DA_MUX_DID_NOT_ACCEPT_PORT_SETUP	Mux didn't send an Ack (Last Rcvd Bit = 1) since didn't accept port activated.
0x00200111	PL_LOGINFO_DA_SEP_DID_NOT_SEND_ACK	SEP did not send an Ack.
0x0020010A	PL_LOGINFO_DA_SEP_CHKSUM_ERROR_AFTER_STOP	SEP returned bad chksum after STOP.
0x0020010B	PL_LOGINFO_DA_SEP_CHKSUM_ERROR_AFTER_STOP_GETDATA	SEP returned bad chksum after STOP while getting data.
0x0020010C	PL_LOGINFO_DA_SEP_UNSUPPORTED_COMMAND	SEP does not support CDB opcode f/w location 1.
0x0020010D	PL_LOGINFO_DA_SEP_UNSUPPORTED_COMMAND_2	SEP does not support CDB opcode f/w location 2.
0x0020010E	PL_LOGINFO_DA_SEP_UNSUPPORTED_COMMAND_3	SEP does not support CDB opcode f/w location 3.
0x0020010F	PL_LOGINFO_DA_MUX_DID_NOT_SEND_ACK	Mux didn't send an Ack (Last Rcvd Bit = 1).

5.2 IOCLogInfo Codes for IR Code Segment

Bits [23:0]	Message Code	Explanation
0x00010000	IR_LOGINFO_RAID_ACTION_ERROR	—
0x00020000	IR_LOGINFO_CODE_UNUSED2	—
0x00010001	IR_LOGINFO_VOLUME_CREATE_INVALID_LENGTH	Amount of information passed down for Create Volume is too large.
0x00010002	IR_LOGINFO_VOLUME_CREATE_DUPLICATE	Creation of duplicate volume attempted (Bus/Target ID checked).
0x00010003	IR_LOGINFO_VOLUME_CREATE_NO_SLOTS	Creation failed due to maximum number of supported volumes exceeded.
0x00010004	IR_LOGINFO_VOLUME_CREATE_DMA_ERROR	Creation failed due to DMA error in trying to read from host.
0x00010005	IR_LOGINFO_VOLUME_CREATE_INVALID_VOLUME_TYPE	Creation failed due to invalid volume type passed down.
0x00010006	IR_LOGINFO_VOLUME_MFG_PAGE4_ERROR	Creation failed due to error reading MFG Page 4.

0x00010007	IR_LOGINFO_VOLUME_INTERNAL_CONFIG_STRUCTURE_ERROR	Creation failed when trying to create internal structures.
0x00010010	IR_LOGINFO_VOLUME_ACTIVATING_AN_ACTIVE_VOLUME	Activation failed due to trying to activate an already active volume.
0x00010011	IR_LOGINFO_VOLUME_ACTIVATING_INVALID_VOLUME_TYPE	Activation failed due to trying to active unsupported volume type.
0x00010012	IR_LOGINFO_VOLUME_ACTIVATING_TOO_MANY_VOLUMES	Activation failed due to trying to active too many volumes.
0x00010013	IR_LOGINFO_VOLUME_ACTIVATING_VOLUME_ID_IN_USE	Activation failed due to Volume ID in use already.
0x00010014	IR_LOGINFO_VOLUME_ACTIVATE_VOLUME_FAILED	Activation failed call to activate Volume returned failure.
0x00010015	IR_LOGINFO_VOLUME_ACTIVATING_IMPORT_VOLUME_FAILED	Activation failed trying to import the volume.
0x00010016	IR_LOGINFO_VOLUME_ACTIVATING_TOO_MANY_PHYS_DISKS	Activation failed, too many phys disks.
0x00010020	IR_LOGINFO_PHYSDISK_CREATE_TOO_MANY_DISKS	Phys Disk failed, too many phys disks.
0x00010021	IR_LOGINFO_PHYSDISK_CREATE_INVALID_LENGTH	Amount of information passed down for Create Phys Disk is too large.
0x00010022	IR_LOGINFO_PHYSDISK_CREATE_DMA_ERROR	Creation failed due to DMA error in trying to read from host.
0x00010023	IR_LOGINFO_PHYSDISK_CREATE_BUS_TID_INVALID	Creation failed due to invalid Bus TargetID passed down.
0x00010024	IR_LOGINFO_PHYSDISK_CREATE_CONFIG_PAGE_ERROR	Creation failed due to error in creating RAID Phys Disk Config Page.
0x00010025	IR_LOGINFO_PHYSDISK_CREATE_DUAL_PORT_ERROR	Creation failed due to error in creating dual port.
0x00010026	IR_LOGINFO_PHYSDISK_DUAL_PORT_FAILOVER	Both paths are unavailable for the Dual Pathing device.
0x00010030	IR_LOGINFO_COMPAT_ERROR_RAID_DISABLED	Compatibility Error: IR Disabled.
0x00010031	IR_LOGINFO_COMPAT_ERROR_INQUIRY_FAILED	Compatibility Error: Inquiry command failed.
0x00010032	IR_LOGINFO_COMPAT_ERROR_NOT_DIRECT_ACCESS	Compatibility Error: Device not direct access device.
0x00010033	IR_LOGINFO_COMPAT_ERROR_REMOVABLE_FOUND	Compatibility Error: Removable device found.
0x00010034	IR_LOGINFO_COMPAT_ERROR_NEED_SCSI_2_OR_HIGHER	Compatibility Error: Device SCSI version not 2 or higher.
0x00010035	IR_LOGINFO_COMPAT_ERROR_SATA_48BIT_LBA_NOT_SUPPORTED	Compatibility Error: SATA device, 48-bit LBA not supported.
0x00010036	IR_LOGINFO_COMPAT_ERROR_DEVICE_NOT_512_BYTE_BLOCK	Compatibility Error: Device does not have 512 byte block sizes.
0x00010037	IR_LOGINFO_COMPAT_ERROR_VOLUME_TYPE_CHECK_FAILED	Compatibility Error: Volume Type check failed.
0x00010038	IR_LOGINFO_COMPAT_ERROR_UNSUPPORTED_VOLUME_TYPE	Compatibility Error: Volume Type is unsupported by FW.
0x00010039	IR_LOGINFO_COMPAT_ERROR_DISK_TOO_SMALL	Compatibility Error: Disk drive too small for use in volume.
0x0001003A	IR_LOGINFO_COMPAT_ERROR_PHYS_DISK_NOT_FOUND	Compatibility Error: Phys disk for Create Volume not found.
0x0001003B	IR_LOGINFO_COMPAT_ERROR_MEMBERSHIP_COUNT	Compatibility Error: membership count error, too many or too few disks for volume type.
0x0001003C	IR_LOGINFO_COMPAT_ERROR_NON_64K_STRIPE_SIZE	Compatibility Error: Disk stripe sizes must be 64-KB.

0x0001003D	IR_LOGINFO_COMPAT_ERROR_IME_VOL_NOT_CURRENTLY_SUPPORTED	Compatibility Error: IME size limited to < 2TB.
0x0001003E	IR_LOGINFO_COMPAT_ERROR_MEDIA_TYPE	The media type of the device is undefined.
0x00010050	IR_LOGINFO_DEV_FW_UPDATE_ERR_DFU_IN_PROGRESS	Device Firmware Update: DFU can only be started once.
0x00010051	IR_LOGINFO_DEV_FW_UPDATE_ERR_DEVICE_IN_INVALID_STATE	Device Firmware Update: Volume must be Optimal/Active/non-quiesced.
0x00010052	IR_LOGINFO_DEV_FW_UPDATE_ERR_INVALID_TIMEOUT	Device Firmware Update: DFU Timeout cannot be zero.
0x00010053	IR_LOGINFO_DEV_FW_UPDATE_ERR_NO_TIMERS	Device Firmware Update: CREATE TIMER FAILED.
0x00010054	IR_LOGINFO_DEV_FW_UPDATE_ERR_READING_CFG_PAGE	Device Firmware Update: Failed to read SAS_IO_UNIT_PG_1.
0x00010055	IR_LOGINFO_DEV_FW_UPDATE_ERR_PORT_IO_TIMEOUTS_REQUIRED	Device Firmware Update: Invalid SAS_IO_UNIT_PG_1 value(s).
0x00010056	IR_LOGINFO_DEV_FW_UPDATE_ERR_ALLOC_CFG_PAGE	Device Firmware Update: Unable to allocate memory for page.
—	IOC_LOGINFO_PREFIX_IOP ((MPI_IOCLOGINFO_TYPE_SAS << MPI_IOCLOGINFO_TYPE_SHIFT) | IOC_LOGINFO_ORIGINATOR_IOP)	
	IOC_LOGINFO_PREFIX_PL ((MPI_IOCLOGINFO_TYPE_SAS << MPI_IOCLOGINFO_TYPE_SHIFT) | IOC_LOGINFO_ORIGINATOR_PL)	
	IOC_LOGINFO_PREFIX_IR ((MPI_IOCLOGINFO_TYPE_SAS << MPI_IOCLOGINFO_TYPE_SHIFT) | IOC_LOGINFO_ORIGINATOR_IR)	
0x00040000	MPI_IOCSTATUS_INTERNAL_ERROR	I/O aborted due to work around.