

Chapter 2

Intro to Attributes and Managers

第 2 章

属性和管理器介绍

The Previous Chapter | 前一章

The previous chapter provided: 前一章提供

- Advantages of the InfiniBand network architecture. IB 网络架构的优势所在。
- An introduction to basic terminology. 基本概念介绍。
- Packet addressing basics. 分组(包)寻址基础。
- The basic roles of channel adapters, routers, switches, and repeaters. 通道适配器，路由器，交换机和中继器的基本作用。
- An introduction to message passing. 报文(消息)传递介绍。

This Chapter | 这一章

This chapter introduces the concept of device attributes, managers, management agents (MAs), and management datagrams (MADs). 本章介绍一些基本概念，包括设备属性，管理器，管理代理和管理数据报。

The Next Chapter | 下一章

The next chapter introduces the concept of the Queue Pair (QP), the message transfer engine that lies at the heart of the IBA technology. Request and response packets, Packet Sequence Numbers (PSNs), and the Verb Layer (a quasi-API used to control an IBA HCA) are introduced. The four IBA QP types are introduced and the concept of the QP Context and its contents are defined. Finally, there is a rather detailed example of a message transfer from one CA to another. 下一章将介绍队列对(QP)的概念，QP 作为消息传输引擎，是 IB 技术的核心所在。下一章还将介绍的内容包括：请求包和响应包，包序列号 (PSN)，和 Verb 层(用以控制 IBA HCA 的准 API)以及四种 IBA QP 类型，QP 上下文概念及内容。下一章的最后，将会给出一个相当详细的例子(并结合插图)，把一条消息是如何从一个 CA 传送到另一个 CA 上去的全过程娓娓道来。

2.1 Why Talk About Attributes and Managers Now?

| 现在为什么要谈属性和管理器？

At this point in the book, it becomes increasingly difficult to avoid discussion of the various device attributes. This being the case, it would seem like a good idea to define what they are, who accesses them, and why. 本书到此为止，要避而不谈各种设备属性已经变得越来越困难了。既然如此，那就索性谈谈吧，谈一下什么是设备属性，都有谁要访问设备属性和为什么他们要访问设备属性。

2.2 Definition of an Attribute | 属性的定义

With the exception of a repeater (a repeater is programmatically invisible; it has no attributes), all IBA devices contain a series of attributes that various managers perform operations upon (e.g.,

reads or writes) for various reasons. For example: 除了中继器(没有属性, 编程不可见)外, 所有的 IBA 设备都包含一系列的属性, 各种管理器因为多种原因会在设备属性上执行操作(如读或写)。例如:

- To discover the existence of an IBA device. 发现 IBA 设备的存在。
- To discover the IBA device type (e.g., a CA, a switch, or a router). 发现 IBA 设备的类型。
- To ascertain the device's current status. 确定设备的当前状态。
- To determine the number of ports implemented on the device. 确定在设备上实现的端口数。
- To control the device's operational characteristics. 控制设备的操作特性。
- etc. 等等。

2.3 Who Accesses Attributes? | 谁访问属性？

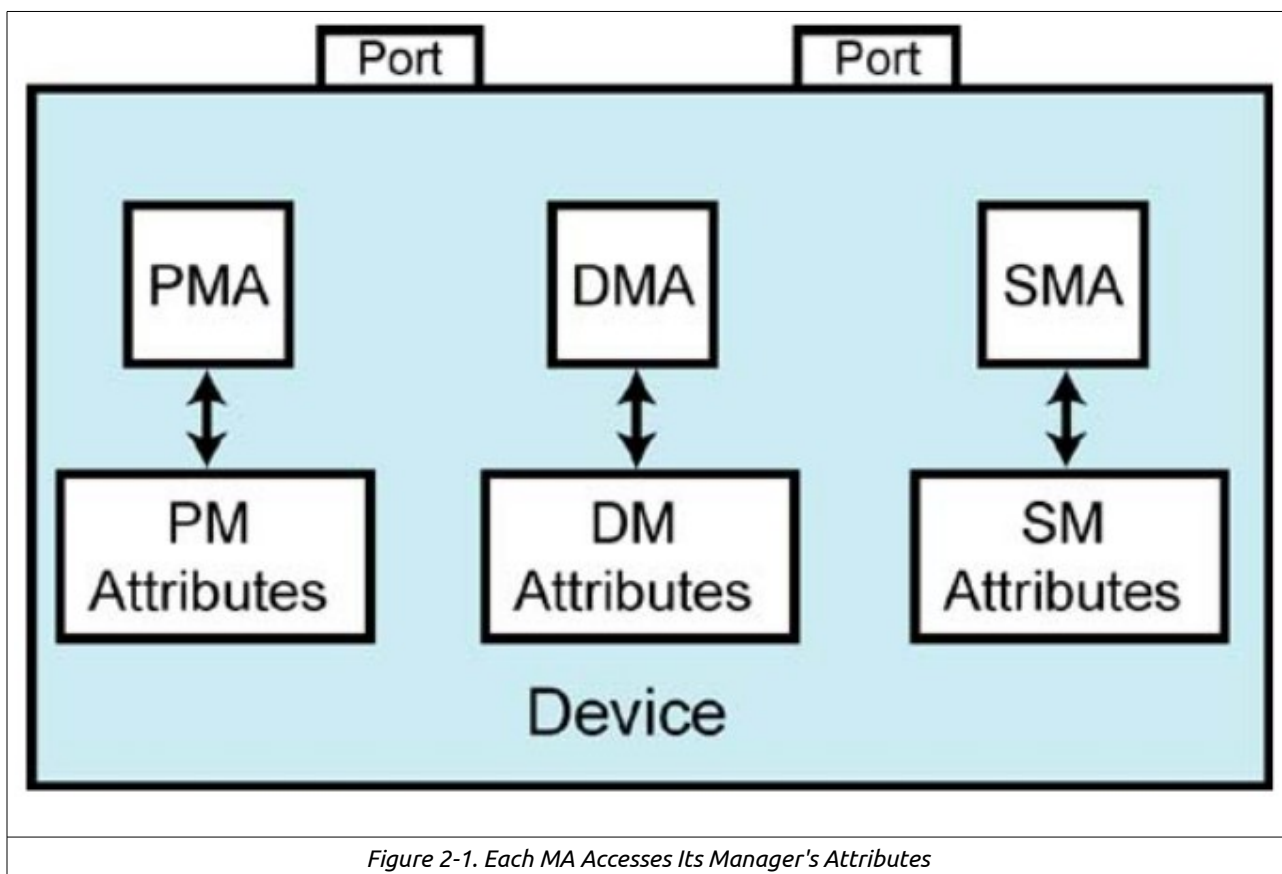
IBA defines a series of managers, each of which is responsible for various aspects of an IBA device's operation. Some examples are: IBA 定义了一系列的管理器, 每一个管理器负责处理 IBA 设备操作的各个方面。例如：

- Subnet Manager (SM). 子网管理器。
- Performance Manager (PM). 性能管理器。
- Device Manager (DM). 设备管理器。
- Communications Manager (CM). 通信管理器。

2.4 MAs Handle Access Requests | 管理代理处理访问请求

Refer to Figure 2-1 on page 27. Each IBA device contains a series of management agents (MAs), each of which handles attribute access requests issued by their respective managers. Some examples are: 参见第 27 页图 2-1。每个 IBA 设备都包含一系列管理代理(MA), 每一个管理代理都处理属性访问请求, 请求来自对应的管理器。例如：

- The Subnet Management Agent (SMA) handles requests issued by the SM. 子网管理代理(SMA)处理子网管理器(SM)发出的请求。
- The Performance Management Agent (PMA) handles requests issued by the PM. 性能管理代理(PMA)处理性能管理器(PM)发出的请求。
- The Device Management Agent (DMA) handles requests issued by the DM. 设备管理代理(DMA)处理设备管理器(DM)发出的请求。



2.5 MA's Response | 管理代理做出的响应

When a MA within a device receives an attribute access request packet from its respective manager, it performs the requested operation on the specified attribute and, in most cases, returns the results in a response packet. 当设备上的管理代理收到来自它相应的管理器发出的属性访问请求包的时候，管理代理在特定的设备属性上执行请求的操作，然后(在大多数情况下)以响应包的方式返回处理结果。

2.6 Managers Use Special Packets Called MADs

| 管理器使用特殊的包(管理数据报)

2.6.1 Request MAD | 请求管理数据报

The various managers use special packets called Management Datagrams (MADs) to request that an operation (i.e., a method) be performed on a device attribute. A request MAD has the following basic characteristics: 各种各样的管理器都使用被称作管理数据报的一种特殊的包来对设备属性执行操作(即方法)。一个请求包包含如下所述的基本特性：

- The MAD message is wholly contained in a single packet's data payload field and the data payload field always contains exactly 256 bytes. 管理数据报(MAD)消息被完全装载于一个包的干数据字段里，而且干数据字段总是包含 256 个字节的数据。
- Some of the elements contained in the MAD are: 管理数据报里包含了如下元素：
 - **Management Class:** Identifies the manager that issued the packet and therefore the management agent within the device that is to process the request MAD. 管理类: 用以标识发出请求包的管理器，进而标识设备上的管理代理。管理代理会处理请求管理数据报。

- **Method:** Specifies the type of operation the target management agent is to perform on the specified attribute. As an example, a Get method performs an attribute read, while a Set method performs an attribute write operation. 方法：指定目标管理代理在特定属性上执行操作的操作类型。例如，GET 方法执行属性读操作，SET 方法执行属性写操作。
- **Attribute ID:** Specifies the attribute to be acted upon (e.g., to read or written). 属性 ID: 指定被操作(例如：读或写)的属性。
- **Attribute Modifier:** Attribute-specific; not required for many attribute/method combinations. Specifies additional information regarding the targeted attribute. As an example, if the manager is targeting the PortInfo attribute on a CA, router, or switch, the Modifier specifies the target port number. 属性修改器：乃属性专有；很多属性/方法联合体并不需要这一项。这一项用来指定与目标属性相关的额外信息。例如，如果管理器管理目标是 CA，路由器或交换机的 PortInfo 属性，属性修改器就被用来指定目标端口号。
- **Data area:** Content depends on the Method and Attribute. Some examples would be: 数据区：其内容取决于方法和属性。例如：
 - If the Method is a Set operation, the data area contains the data to be written to the specified attribute. 如果方法是 SET 操作，数据区包含了要写入特定属性的数据。
 - If the Method is a Get operation, the data area contents is undefined in the request MAD, but contains the requested attribute's contents in the corresponding response MAD returned by the device. 如果方法是 GET 操作，数据区内容未被请求包定义，但是在对应的响应包(从设备返回)里包含了读取到的请求属性的内容。

2.6.2 Response MAD | 响应管理数据报

Upon receipt of a request MAD from its respective manager, the MA performs the operation on the indicated attribute and returns the results in a response MAD. The response MAD contains (among other things): 管理代理在收到来自对应的管理器发出的请求管理报文后，在指定设备属性上执行操作，然后返回处理结果，通过响应包的形式。(除了别的以外)响应包包括:

- **Status field:** This 16-bit field indicates the operation's completion status. The Status field is only valid in a response MAD generated by the target in response to a request MAD. It is formatted as follows: 状态字段：该字段占 16 位，用以显示操作完成的状态。状态字段只在响应管理数据报里有效，被请求方生成一个响应管理数据报，对发出请求的管理数据报做出响应。该字段格式如下：
 - Lower 8 bits = status common to all classes. These are: 低 8 位=对所有管理类都通用的状态。它们是：
 - Busy, MAD discarded (not an error). 忙，管理数据报被丢弃(不是错误)。
 - Redirect required (not an error). 需要进行重定向(不是错误)。
 - Class not supported. 管理类不被支持。
 - Method not supported. 方法不被支持。
 - Method/Attribute combination not supported. 方法/属性联合体不被支持。
 - One or more Attribute fields contain bad values. 至少一个属性字段的值无效。
 - Upper 8 bits = class-specific status. 高 8 位=管理类特定的状态。
- **Data field.** The content of this field is defined by the type of request MAD this is a response to. Some examples would be: 数据字段。该字段内容取决于请求的管理数据报类型。
 - If the request was an attribute read (i.e., a Get), the data field contains the data read from the attribute indicated in the request MAD. 如果请求类型是属性读(即 GET), 该数据字段就包含了从指定设备属性上读取到的内容。
 - If the request was an attribute write (i.e., a Set), the data field contains the data read from the attribute indicated in the request MAD after the Set operation (i.e., the attribute write) was performed. 如果请求类型是属性写(即 SET), 该数据字段就包含了 SET 操作(即属性写)被执行后再从指定设备属性上读取到的内容。

2.7 Attribute Format and Documentation Conventions | 属性格式与文档约定

2.7.1 General | 概要

The IBA specification defines many different types of attributes: IBA 规范定义了很多不同类型的属性：

- An attribute may be very simple and consists of a single item. An example would be the LEDInfo (Light-Emitting Diode Information) attribute. 超简单属性(仅包含单个条目)。例如：LEDInfo 属性。
- An attribute may take the form of a table. An example would be the Linear-ForwardingTable attribute in a switch. 采用表的形式而呈现出来的(较复杂)属性。例如：属于交换机的一个属性 LinearForwardingTable。
- An attribute may consists of data structure containing a number of elements. An example would be the PortInfo attribute. 包含了若干元素的数据结构的(复杂)属性。例如：PortInfo 属性。

2.7.2 Attribute and Element Designation | 属性和元素命名约定

As just discussed, many attributes are actually comprised of a series of elements (the specification frequently refers to them as components). As an example, the PortInfo attribute is a data structure containing 46 elements (see Table 29-5 on page 825). The specification references a particular element of a multi-element attribute using the following format: 如我们刚刚讨论过的，很多属性实际上有一系列的元素(IBM 规范经常地把它们叫做元件)组成。例如，PortInfo 属性是一个包含了 46 个成员的数据结构(参见第 825 页表 29-5)。IBM 规范在引用一个包含多个成员的属性的某一特定的成员时，采用如下的格式：

AttributeName.ElementName 属性名称.元素名称

Some examples would be: 例如：

- *PortInfo.M_Key*
- *PortInfo.LID*
- *PortInfo.Capabilitymask*
- *SMInfo.GUID*
- *SMInfo.ActCount*
- *SwitchInfo.LinearFDBCap*
- *SwitchInfo.DefaultPort*

In this book, the author has italicized all instances of attributes and their elements. 为了便于阅读，本书中出现的属性实例及元素一律用斜体字标明。

