21 计算机专业技术丛书（2）

SNA MIGRATING TO TCP/TP

马丁·布莱尔 著

本光盘内容包括：
本版电子书

网络应用工程教程 SNA迁移到TCP/IP

（英文版）

北京希望电子出版社
Beijing Hope Electronic Press
www.bhp.com.cn

21 计算机专业技术丛书（2）

SNA MIGRATING TO TCP/TP

马丁·布莱尔 著

本光盘内容包括:
本版电子书

网络应用工程教程 SNA迁移到TCP/IP

（英文版）

北京希望电子出版社
Beijing Hope Electronic Press
www.bhp.com.cn

内 容 提 要

本书是一本关于计算机网络应用工程的教科书。它详细地讲述了怎样实现从一个 SNA 体系的子网到 TCP/IP 体系的迁移。本书由两大部分构成，第一部分是制定从 SNA 子网向 IP 迁移的计划，包括各种技术准备。第二部分是具体的迁移配置，包括各种技术参数的设置、调试等，通过实施以上工程，可以大大降低网络的运行成本。

本书内容新、理论联系实际，讲练结合，有很强的实用性和指导性，面向开发和编程人员，对于计算工程专业的学生和社会上广大计算机工程师是一本不可多得的实用指导性教材。

本版光盘内容包括本版电子书。

系 列 书：计算机专业技术丛书（2）
书 名：网络应用工程教程——SNA 迁移到 TCP/IP　SNA Migrating to TCP/IP
总 策 划：北京希望电脑公司
文本著作者：〔美〕马丁·布莱尔
责 任 编 辑：陈河南
CD 制 作 者：希望多媒体创作中心
CD 测 试 者：希望多媒体测试部
出版、发行者：北京希望电子出版社
地 址：北京中关村大街 26 号，100080
网址：www.bhp.com.cn　E-mail：lwm@hope.com.cn
电话：010-62562329,62541992,62637101,62637102
010-62633308,62633309（发行）
010-62613322-215（门市）　010-62547735（编辑部）
经 销：各地新华书店、软件连锁店
排 版：希望图书输出中心
CD 生 产 者：北京中新联光盘有限责任公司
文本印刷者：北京广益印刷厂
开本 / 规格：787 毫米×1092 毫米　1/16 开本　19.375 印张　340 千字
版次 / 印次：2001 年 5 月第 1 版　2001 年 5 月第 1 次印刷
本 版 号：ISBN 7-900071-16-4/TP•15
定 价：50.00 元（1CD，含配套书）

说明：凡我社光盘配套图书若有缺页、倒页、脱页、自然破损，本社发行部负责调换

PART ONE

We present an overview of the issues involved in the integration the SNA and TCP/IP protocol stacks. Specifically, we discuss the motivation for moving away from a link layer protocol integration towards a network layer integration. We give rationale for the selection of IP as the backbone networking protocol. We provide an overview of the SNA and TCP/IP protocol suites and introduce the options for carrying SNA traffic over an IP network. A comparison of these techniques leads to the conclusion of using Enterprise Extender for this purpose. Finally, we provide a more detailed look at Enterprise Extender and present a general strategy for the final migration. Part 2, "Implementation details: A migration scenario" documents a case study of a migration to EnterpriseExtender.

Contents

Protocol interaction: Planning the subarea to IP migration

SNA and TCP/IP protocol integratiom

Chapter 1

There was a time when a typical enterprise installation used only one networking protocol to access the applications running on its computers. Exactly which protocol was used depended almost entirely on which manufacturer's hardware and operating system were installed. Most IBM installations used SNA, most DEC installations used DECNet, most UNIX installations used TCP/IP, and so on.

In recent years, the direction has changed; the networking protocols have, more and more, been determined by the applications that the customer has chosen to install. This has led inevitably to a proliferation of networking protocols. This has been followed by a push to reduce the number of these protocols due to the costs involved in maintaining many protocols within a single physical network. This process will probably never end, but great progress has been made and most large enterprises now have, at most, two or three networking protocols in serious use. For installations using IBM mainframes or mid-range systems, these will include SNA and TCP/IP, with perhaps NetBIOS or IPX running on the site LANs.Since LAN protocols (NetBIOS in particular) do not take kindly to being run over the wide area, customers will often use either SNA or TCP/IP to carry traffic(where needed) between sites. Thus the major issue facing large installations today is how to carry both SNA and TCP/IP traffic across the enterprise network most efficiently.

It is important to realize that both of these protocols will remain in wide spread use for a very long time. To convert completely to one or the other would involve a total rewrite or replacement of all the applications that use the less desirable one.

There is no protocol conversion technique available today (and none visible in the future) that will provide a complete translation between all the features used by SNA applications and all the features used by TCP/IP applications. At the application programming interface, therefore, both SNA and TCP/IP must be provided.

Fortunately, this is not true at the lower layers of the networking (OSI) reference model. SNA and TCP/IP are almost completely independent of the physical and data link layers of the architecture, and their differences at the next (network) layer are manageable. Only in the upper layers are SNA and TCP/IP sufficiently different to make it virtually impossible to translate fully between them. Therefore, it is possible to combine SNA and TCP/IP at a transportlevel without affecting the upper layers. Hence, the practical choices of integration are to combine the protocols at the physical, link, or network layers.

1.1 | Integration at the physical layer

We will refer to this technique as multiplexing. This is the technique used originally by channelized modems, then by time division multiplexers, then by the integrated-services digital network (ISDN). Each protocol sees its own physical circuit and uses its own data link control (DLC) over it, while the network combines these DLCs on to a single real physical circuit. The nodes on the network then route each protocol independently using the protocol's native techniques.

Multiplexing is regarded with little favor these days because it requires a separatephysical connection for each protocol at each routing node. A much more efficient way is to run both protocols over the same physical connection, which brings us to the second and third options, link and network layers. Integrating at the physical layer provides no real benefit over integrating at the link layer.

1.2 | Integration at the link layer

In this case, the nodes on the network combine both protocols on the same physical connection, since both support much the same range of link-levelprotocols. Again, the two protocols must be routed independently using the nativetechnique of each.

The DLC and the transport medium used must be able to distinguish between thehigher-layer protocols being carried, so that they can be passed to the appropriate routing function. Examples of this include:

- **Local area networks.** A LAN station can support multiple logical connectionsin addition to connectionless transport. Each may carry a different protocol. LANs may be bridged together to provide a single transport medium across the wide area network.
- **Frame relay.** A frame relay device can support multiple virtual circuits (logical connections), each of which can carry a different protocol. In addition, protocols may be multiplexed over the same virtual circuit using RFC 2427 (an update of RFC 1490 and RFC 1294).
- **Asynchronous transfer mode (ATM),** which is similar to frame relay in concept but designed for higher speeds. Each ATM virtual circuit can carry one protocol, or a number

of protocols multiplexed together as defined in RFC 1483.

- **X.25.** Each X.25 device can maintain multiple virtual circuits and therefore multiple independent protocols.
- **Point-to-Point Protocol (PPP).** Routers are able to carry multiple protocols independently over PPP connections between them.

Use of these shared transport media confers an additional advantage, in that you can now build an end-to-end switched network that does not require intermediate routing function for any of the protocols carried. However, it still has the disadvantage that you need a complete stack of each protocol implemented on each endpoint node in the network. Additionally, if intermediate routing must be performed, the physical network must contain a routing infrastructure throughout for each of the protocols.

With link layer integration, the endpoints require multiple complete protocol stacks. The routing infrastructure (if needed) must also support these multiple protocols, either by having routing nodes serve both protocols or by having different routing nodes serving each protocol. While this is not usually a problem on large servers or routers, and less of a problem in an end-to-end switched environment, it can make a significant difference to the configuration and the management of user workstations and branch routers.

1.3 | Integration at the network layer

Integrating at the network layer is more complex because the SNA and IP routing techniques are rather different. In essence, it means building a backbone routing network for one protocol (which is probably already in place), then somehow encapsulating the essential information from the other protocol's packets and carrying it over the backbone. Thus we may see SNA carried over an IP network, or IP carried over an SNA network.

With this method you need to install only the upper layers of each stack on the application nodes in the network, and the lower layers of the chosen single stack on all nodes. On the other hand, the management and operation of the network tend to be more complex and less efficient.

1.4 | Choosing the integration layer

It is important to understand that the choice between link-layer and network-layer integration is one of finding the most cost-effective way of running a multiprotocol network, and not one of interoperability. An application written to (for example) an SNA programming interface will always require a partner SNA application, regardless of what kind of network is used to transport the data; it will never talk to a (TCP/IP) Sockets application without some form of protocol conversion. The integration techniques we describe here provide protocol coexistence, not conversion.