This article provides guidance for understanding internetworking technology. Different components of internetwork and the protocols used are described.

Contents

Internetworking Basics

An internetwork is a collection of individual networks, connected by intermediate networking devices, that functions as a single large network. Internetworking refers to the industry, products, and procedures that meet the challenge of creating and administering internetworks.

The following articles provide information about internetworking basics:

- Internetworking Basics
- Introduction to LAN Protocols
- Introduction to WAN Technologies
- Bridging and Switching Basics
- Routing Basics
- Network Management Basics
- Open System Interconnection Protocols

LAN Technologies

A LAN is a high-speed data network that covers a relatively small geographic area. It typically connects workstations, personal computers, printers, servers, and other devices. LANs offer computer users many advantages, including shared access to devices and applications, file exchange between connected users, and communication between users via electronic mail and other applications.

The following articles provide information different LAN technologies:

- Ethernet Technologies
- Token Ring/IEEE 802.5

WAN Technologies

A WAN is a data communications network that covers a relatively broad geographic area and that often uses transmission facilities provided by common carriers, such as telephone companies. WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

The following articles provide information about the various protocols and technologies used in WAN environments:

- Frame Relay
- High-Speed Serial Interface
- Integrated Services Digital Network
- Point-to-Point Protocol
- Switched Multimegabit Data Service
- Synchronous Data Link Control and Derivatives
- X.25
- Digital Subscriber Line

Internet Protocols

The Internet protocols are the world's most popular open-system (nonproprietary) protocol suite because they can be used to communicate across any set of interconnected networks and are equally well suited for LAN and WAN communications. The Internet protocols consist of a suite of communication protocols, of which the two best known are the Transmission Control Protocol (TCP) and the Internet Protocol (IP). The Internet protocol suite not only includes lower-layer protocols (such as TCP and IP), but it also specifies common applications such as electronic mail, terminal emulation, and file transfer. This article provides a broad introduction to specifications that comprise the Internet protocols. Discussions include IP addressing and key upper-layer protocols used in the Internet. Specific routing protocols are addressed individually later in this document.

The following articles provide information about different IOS IP technologies:

- Internet Protocols
    - AppleTalk
    - Banyan VINES
    - IBM Systems Network Architecture Protocols
    - DECnet
    - Simple Multicast Routing Protocol
- Internet Protocol Multicast

- IPv6

Bridging and Switching

Bridges and switches are data communication devices that operate principally at Layer 2 of the OSI reference model. As such, they are widely referred to as data link layer devices. Several kinds of bridging have proven important as internetworking devices. Transparent bridging is found primarily in Ethernet environments, while source-route bridging occurs primarily in Token Ring environments. Translational bridging provides translation between the formats and transit principles of different media types (usually Ethernet and Token Ring). Finally, source-route transparent bridging combines the algorithms of transparent bridging and source-route bridging to enable communication in mixed Ethernet/Token Ring environments. Today, switching technology has emerged as the evolutionary heir to bridging-based internetworking solutions. Switching implementations now dominate applications in which bridging technologies were implemented in prior network designs. Superior throughput performance, higher port density, lower per-port cost, and greater flexibility have contributed to the emergence of switches as replacement technology for bridges and as complements to routing technology.

The following articles provide information about the technologies employed in devices loosely referred to as bridges and switches:

- Transparent Bridging
- Mixed-Media Bridging
- Source-Route Bridging
- Asynchronous Transfer Mode Switching
- LAN Switching and VLANs
- MPLS/Tag Switching
- Data-Link Switching
- Tag Switching

Routing

Routing is the act of moving information across an internetwork from a source to a destination. Along the way, at least one intermediate node typically is encountered. Routing is often contrasted with bridging, which might seem to accomplish precisely the same thing to the casual observer. The primary difference between the two is that bridging occurs at Layer 2 (the link layer) of the OSI reference model, whereas routing occurs at Layer 3 (the network layer). This distinction provides routing and bridging with different information to use in the process of moving information from source to destination, so the two functions accomplish their tasks in different ways.

The following articles provide information different routing technologies:

- Fiber Distributed Data Interface
- IBM Systems Network Architecture Routing
- NetWare Link-Services Protocol
- Open System Interconnection Routing Protocol
- Open Shortest Path First
- Routing Information Protocol
- Border Gateway Protocol
- Interior Gateway Routing Protocol
- Enhanced Interior Gateway Routing Protocol
- Xerox Network Systems

Network Management

Network management means different things to different people. In some cases, it involves a solitary network consultant monitoring network activity with an outdated protocol analyzer. In other cases, network management involves a distributed database, auto polling of network devices, and high-end workstations generating real-time graphical views of network topology changes and traffic. In general, network management is a service that employs a variety of tools, applications, and devices to assist human network managers in monitoring and maintaining networks.

The following articles provide information different network management technologies:

- Virtual Private Networks
- Directory-Enabled Networking
- Remote Monitoring
- Simple Network Management Protocol

Voice/Data Integration Technologies

Voice/data integration is important to network designers of both service providers and enterprise. Service providers are attracted by the lower-cost model-the cost of packet voice is currently estimated to be only 20 to 50 percent of the cost of a traditional circuit-based voice network. Likewise, enterprise network designers are interested in direct cost savings associated with toll-bypass and tandem switching. Both are also interested in so-called "soft savings" associated with reduced maintenance costs and more efficient network control and management. Finally, packet-based voice systems offer access to newly enhanced services such as Unified Messaging and application control. These, in turn, promise to increase the productivity of users and differentiate services.

Integration of voice and data technologies has accelerated rapidly in recent years because of both supply- and demand-side interactions. On the demand side, customers are leveraging investment in network infrastructure to take advantage of integrated applications such as voice applications. On the supply side, vendors have been able to take advantage of breakthroughs in many areas, including standards, technology, and network performance.

The following article provides information about Voice/Data Integration Technologies:

- Voice/Data Integration Technologies

Wireless Technologies

Wireless communication is the transfer of information over a distance without the use of electrical conductors or "wires".[1] The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications). When the context is clear, the term is often shortened to "wireless". Wireless communication is generally considered to be a branch of telecommunications.

It encompasses various types of fixed, mobile, and portable two way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of wireless technology include GPS units, garage door openers and or garage doors, wireless computer mice, keyboards and headsets, satellite television and cordless telephones.

The following article provides information about Wireless Technologies:

- Wireless Technologies

Cable Access Technologies

Historically, CATV has been a unidirectional medium designed to carry broadcast analog video channels to the maximum number of customers at the lowest possible cost. Since the introduction of CATV more than 50 years ago, little has changed beyond increasing the number of channels supported. The technology to provide high-margin, two-way services remained elusive to the operator.

Cable television (CATV) is a unidirectional medium carrying broadcast analog video channels to the most customers possible at the lowest possible cost to the CATV service provider. Since the introduction of CATV more than 50 years ago, little has changed beyond increasing the number of channels supported.

The following article provides information about Cable Access Technologies:

- Cable Access Technologies

Dial-up Technology

Dialup is simply the application of the Public Switched Telephone Network (PSTN) to carry data on behalf of the end user. It involves customer premises equipment (CPE) device sending the telephone switch a phone number to direct a connection to. The AS3600, AS5200, AS5300, and AS5800 are all examples of routers that have the capability to run a PRI along with banks of digital modems. The AS2511, on the other hand, is an example of a router that communicates with external modems.

Since the time of Internetworking Technologies Handbook, 2nd edition, the carrier market has continued to grow, and there have been demands for higher modem densities. The answer to this need was a higher degree of interoperation with the telco equipment and the refinement of the digital modem: a modem capable of direct digital access to the PSTN. This has allowed the development of faster CPE modems that take advantage of the clarity of signal that the digital modems enjoy. The fact that the digital modems connecting into the PSTN through a PRI or a BRI can transmit data at more than 53 K using the V.90 communication standard attests to the success of the idea.

The following article provides information about Dial-up Technology:

- Dial-up Technology

Security Technologies

With the rapid growth of interest in the Internet, network security has become a major concern to companies throughout the world. The fact that the information and tools needed to penetrate the security of corporate networks are widely available has increased that concern.

Because of this increased focus on network security, network administrators often spend more effort protecting their networks than on actual network setup and administration. Tools that probe for system vulnerabilities, such as the Security Administrator Tool for Analyzing Networks (SATAN), and some of the newly available scanning and intrusion detection packages and appliances, assist in these efforts, but these tools only point out areas of weakness and may not provide a means to protect networks from all possible attacks. Thus, as a network administrator, you must constantly try to keep abreast of the large number of security issues confronting you in today's world. This article describes many of the security issues that arise when connecting a private network to the Internet.

The following article provides information about Security Technologies:

- Security Technologies

Quality of Service Networking

Quality of Service (QoS) refers to the capability of a network to provide better service to selected network traffic over various technologies, including Frame Relay, Asynchronous Transfer Mode (ATM), Ethernet and 802.1 networks, SONET, and IP-routed networks that may use any or all of these underlying technologies. The primary goal of QoS is to provide priority including dedicated bandwidth, controlled jitter and latency (required by some real-time and interactive traffic), and improved loss characteristics. Also important is making sure that providing priority for one or more flows does not make other flows fail. QoS technologies provide the elemental building blocks that will be used for future business applications in campus, WAN, and service provider networks. This article outlines the features and benefits of the QoS provided by the Cisco IOS QoS.

The following articles provide information about Quality of Service:

- Quality of Service Networking
- Resource Reservation Protocol

Network Caching Technologies

Although the volume of Web traffic on the Internet is staggering, a large percentage of that traffic is redundant-multiple users at any given site request much of the same content. This means that a significant percentage of the WAN infrastructure carries the identical content (and identical requests for it) day after day. Eliminating a significant amount of recurring telecommunications charges offers an enormous savings opportunity for enterprise and service provider customers.

Web caching performs the local storage of Web content to serve these redundant user requests more quickly, without sending the requests and the resulting content over the WAN.

The following article provides information about Network Caching Technologies:

- Network Caching Technologies

IBM Network Management

IBM network management refers to any architecture used to manage IBM Systems Network Architecture (SNA) networks or Advanced Peer-to-Peer Networking (APPN) networks. IBM network management is part of the IBM Open-Network Architecture (ONA) and is performed centrally by using management platforms such as NetView and others. It is divided into five functions that are similar to the network management functions specified under the Open System Interconnection (OSI) model. This article summarizes the IBM network management functional areas, ONA network management architecture, and management platforms.

The following article provides information about IBM Network Management:

- IBM Network Management

Multiservice Access Technologies

Multiservice networking is emerging as a strategically important issue for enterprise and public service provider infrastructures alike. The proposition of multiservice networking is the combination of all types of communications, all types of data, voice, and video over a single packet-cell-based infrastructure. The benefits of multiservice networking are reduced operational costs, higher performance, greater flexibility, integration and control, and faster new application and service deployment.

The following article provides information about Multiservice Access Technologies: