

Glossary

API

An Application Programming Interface is an entry point to a system of software. The API provides programmatic access to a set of software services. SNMP is included as part of many versions of Unix, and access to it is made using the system API. Likewise, a third-party software product such as the Microsoft Visual C++ SNMP API or the Sun Microsystems JDMK product can provide an API

ASN.1

Abstract Syntax Notation One is a formal language for the abstract (platform-independent) description of messages exchanged between machines. It is used to encode and decode messages in a wide range of applications, including SNMP. Objects such as integers are encoded in a manner called tag-length-value (TLV) that is independent of any processor architecture, such as big or little endian. The tag indicates the object type, the length is the object size, and the value is the encoded object. ASN.1 also allows structured (or nested) definitions

AS

An Autonomous System is an IP network controlled by one administrator on behalf of a single administrative entity (such as a university, a business enterprise, or a business division). Also referred to as a routing domain, an autonomous system is assigned a globally unique number called an Autonomous System Number

BGP4

The Border Gateway Protocol Version 4 is an exterior gateway protocol used for routing between different autonomous systems. It is mainly used for providing reachability between administrative domains that use different routing and protection methods. Interior gateway protocols, such as OSPF and IS-IS, are used inside autonomous systems

CDR

Call Detail Records are created by NEs when a call setup (e.g., a Q.931 ISDN SETUP message) message is received. CDRs reflect NE resource consumption such as calling and called parties, bandwidth used, and processing time. CDR data fields are fully populated when the underlying call/transaction ends. At this point, NEs with CDR data can often be configured to emit their records for capture and processing by an external billing system. NEs may buffer some CDRs after transmission, but if call volume is high, then data may be quickly overwritten. Many PABXs create CDRs for use in billing software

CIM

Common Information Model is a model for describing overall management information in a network environment. It is a vendor-independent, conceptual information model for describing management data. CIM consists of a specification and a schema. The specification defines the details for integration with other management models, while the schema provides the actual model descriptions. It allows for the interchange of management information between management systems and applications

CLI

A Command-Line Interface is a means of interaction provided as standard with many NEs. The Cisco CLI has been a de facto standard. The CLI usually consists of a tree-structured menu system used to configure NEs. Many devices also allow scripting facilities in order to speed up the installation and configuration process. Some network operators favor one CLI purely because they have a lot of experience with the associated equipment

CO

Central Office of a service provider. It consists of switches, routers, PABXs, collocated servers, power, connections to customer premises equipment via the local loop, SS7 stack, toll trunks, and so on

COM

Component Object Model is a Microsoft-specific software architecture that allows applications to be built from binary software components. COM is the underlying architecture that forms the foundation for higher level software services such as support for compound documents, custom controls, interapplication scripting, and data transfer

COS

Class of Service is a method of differentiating the treatment received by specific traffic elements as they traverse a network. It tends to work on the basis of marking the traffic in some fashion and then delegating to the NEs to use that marking to apply a specific forwarding treatment. This can include mechanisms such as queuing (higher

priority queue for traffic marked with a high priority), scheduling, the path taken by the traffic, and so on. CoS is quite distinct from QoS, which tends to reserve network resources ahead of the arrival of traffic

COTS

Commercial Off-The-Shelf is an expression used to describe standard software packages available through retail channels. COTS software generally contains no proprietary components and includes Web browsers, word processors, and desktop productivity tools. COTS is of great interest to network operators and equipment vendors for slightly different reasons. Vendors may be happy to incorporate COTS software into their solutions in order to reduce development costs. Network operators like it because it helps in providing a degree of vendor-independence for at least part of a solution. However, no solution is ideal, and in uncertain times COTS suppliers may not have the degree of longevity that is generally required by large network operators

CPE

Customer Premises Equipment is the term used to describe SP-owned equipment that is deployed on a customer's premises. Typically, CPE may consist of a switch or a router. In many cases, the service provider manages the CPE and the enterprise merely pushes its traffic into the device. This helps to reduce the workload on the enterprise IT staff and replaces this with a fixed monthly outlay. Another merit of CPE from the SP perspective is that it makes it a little hard for a customer to change from one service provider to another

CTI

Computer Telephony Integration is a technique by which computers control telephony systems such as PABXs. Call centers are a good example of CTI--calls are queued up and routed to agents based on criteria such as caller ID and called number. A less obvious example of CTI is the way in which computers are used to control the operation of mobile telephony networks

DECT

Digital Enhanced Cordless Telecommunications is a radio technology suited for voice data and networking applications with geographical range requirements up to a few hundred meters. It can be used for in-building enterprise mobile telephony as an add-on to an existing voice system

DEN

Directory-Enabled Networking is a specification of an object-oriented information model that models network elements and services as part of a managed environment in a repository-independent fashion. It provides a mapping of this information to a form that is suitable for implementation in a directory that uses LDAP or X.500 as its access protocol

DES

Data Encryption Standard is a privacy protocol used to protect messages in transit across networks

DLCI

Data Link Connection Identifier is a field in a Frame Relay link layer header. It is used as part of the addressing data for forwarding frames

DMI

Desktop Management Interface is an independent group devoted to providing desktop management

DNS

Domain Name System is a hierarchical system for resolving names (such as www.microsoft.com) into IP addresses

DS

Differentiated Services is an approach to providing quality of service in networks; it employs a small, well-defined set of building blocks from which a variety of aggregate behaviors may be built. A short bit pattern in each packet, in the IPv4 Type of Service (now called the DS octet) byte or the IPv6 Traffic Class byte, is used to mark a packet to receive a particular forwarding treatment, or per-hop behavior, at each network node. DS is thought to provide a scalable way of implementing layer 3 services because the requisite actions are distributed throughout the network without the need for networkwide state machines

DSCP

Differentiated Services Code Point is an integer value encoded in the DS field of an IP header. The DSCP is an example of traffic marking because its value corresponds with a preferred QoS as the packet traverses the network. The DSCP value corresponds to a specific QoS

DSL

Digital Subscriber Line is an access technology that allows simultaneous Internet connectivity and voice calls. The speed is much higher than a regular modem and generally no new wiring is needed, though there may be

distance limitations

DTL

Designated Transit List is a set of hops (or a path) in an ATM network used in creating a virtual circuit. A DTL is similar to an MPLS ERO

DWDM

Dense Wavelength Division Multiplexing is a fiber-optic transmission technique that employs light wavelengths. Multiple incoming optical signals are combined into a group for transmission over a single fiber. DWDM can be used as a means of extending the lifespan of existing fibers

ECN

Explicit Congestion Notification is a mechanism for informing routers that congestion may be about to occur. It is always best to avoid congestion if at all possible because of the need to provide defined levels of service (QoS) for different traffic types. Some traffic types, such as email, can recover from dropped (and subsequently retransmitted) packets. The same is not true for real-time services such as VoIP. So, if a router receives a packet with ECN content, then it should try to take some actions, such as dropping low-priority traffic (or traffic that has been marked droppable). ECN is yet another example of a type of policy, in this case, an emergency traffic management policy

ELAN

Emulated LANs can be created using ATM LAN E(mulation) technology to join together existing LANs running protocols such as IP, Novell IPX, AppleTalk, and DECnet. ELANs leverage existing underlying ATM technology to provide connectivity

EMS

Element Management Systems are often hosted on NEs and offer various configuration options such as where to send traps and notifications. In many cases, the EMS is a front end to an SNMP agent. Also, once a device is powered up for the first time, the user can configure it using the EMS to assign IP addresses, subnet masks, and so on. An EMS can also be hosted on an external computer system and used to manage NEs that provide only a simple CLI. Somewhat confusingly, EMS is also the term used by Telcordia to describe what is often in fact an NMS

FCAPS

Fault, Configuration, Accounting, Performance, and Security are the OSI functional areas of network management. In the Fault area, network problems are found and corrected. Root cause analysis may be used to give an exact reason for a given fault. In the Configuration area, network operation is monitored and controlled. Hardware and NE software changes are recorded along with an inventory of deployed equipment and firmware. In the Accounting area, resources are shared out fairly among network users. This area ensures that end users are billed appropriately. The Performance area is involved with managing the overall performance of the network. The Security area is used to protect the network against hackers, unauthorized users, and physical or electronic tampering

FEC

Forwarding Equivalence Class is a group of IP packets that are forwarded over the same path and with the same traffic handling treatment. An FEC can be a destination IP subnet or a traffic class that the LER considers significant

FR

Frame Relay is a layer 2 technology similar in many ways to ATM. It provides a connection-oriented model

FTN

FEC-to-NHLFE is a MIB table that maps FECs to a next-hop label-forwarding entry. The latter is used for labeled packet forwarding and contains the next hop, the label value to be replaced, and the label stack to be added. This MIB controls the transition between the IP and MPLS domains and contains rules for MPLS-encoding IP packets and pushing them into LSPs or tunnels.

GMPLS

Generalized Multiprotocol Label Switching is also referred to as multiprotocol lambda switching. GMPLS supports not only devices that perform packet switching, but also those that perform switching in the time, wavelength, and space domains. The development of GMPLS requires modifications to current signaling and routing protocols. It has also triggered the development of new protocols such as the Link Management Protocol

IANA

Internet Assigned Numbers Authority is an organization that was responsible for the allocation of IP addresses,

port numbers, character sets, and so on. This work is now performed by an organization called the Internet Corporation for Assigned Names and Numbers (ICANN)

IDL

Interface Definition Language is a means of exporting programmatic services over a network. IDL enables distributed applications to transparently invoke operations on remote networked hosts. An IDL file is not dissimilar from a C header file except that the actual code implementation (behind the IDL definitions) is located on a host that is remote to the caller

IETF

Internet Engineering Task Force is a organization with thousands of members. It is the governing body for Internet Protocol (IP) standards. The IETF has IP and MPLS protocol ownership and is also responsible for originating the MPLS technology

IN

Intelligent Networking is an expression used with reference to mobile telephony networks. One application of IN is providing extra network-based software, for example, to peek at the contents of SS7 messages as they traverse a network. Depending on the data in the messages, specific actions can be taken

INTSERV

Integrated Services is a model used for providing traffic forwarding service levels in IP/MPLS networks. It allows for microflows to be created with reserved resources (such as bandwidth) and other traffic handling characteristics (maximum packet size, maximum burst size, etc.). Traffic is pushed into these microflows in the direction of the required destination. The disadvantages of IntServ are that the microflows must be explicitly traced and reserved, and thereafter they must be refreshed. This adds traffic into the network and can cause scalability problems

IP

Internet Protocol provides for the transmission of datagrams from a source to a destination. The source and destination are hosts identified by fixed-length IP addresses. IP also provides for fragmentation and reassembly of long datagrams if necessary

IS-IS

Intermediate System-Intermediate System is an International Organization for Standardization (ISO) dynamic routing specification. Often deployed in IP networks, IS-IS provides similar capabilities to OSPF

ISDN

Integrated Service Digital Network is a set of CCITT/ITU standards for digital transmission. There are two levels of service: the Basic Rate Interface (BRI), intended for home users and small to medium enterprises, and the Primary Rate Interface (PRI), for larger users

ISP

Internet Service Provider is an SP that provides Internet access. ISPs can also offer more than just Internet access--for example, VoIP

IT

Information Technology represents a group of people dedicated to maintaining the technical infrastructure in an organization. Infrastructure includes switches, routers, PABXs, servers, hosts, and so on

J2EE

Java 2 Platform, Enterprise Edition, takes advantage of many features of the Java 2 Platform, Standard Edition, such as portability, JDBC for database access, CORBA support, and a security model. J2EE adds support for Enterprise JavaBeans, JavaServer Pages, Java Servlets, and XML

JDK

Java Development Kit contains all the software and tools needed to compile, debug, and run applets and applications written using Java language. It can also be seen as a software layer that resides between Java applets (and Java applications) and the underlying platform

JDMK

Java Development Management Kit from Sun Microsystems provides a set of Java classes and tools for developing SNMP-based, management software (agents and managers). Programs can be created, deployed, updated, enhanced, or removed in real time

JIT

Just-in-Time is a type of Java compiler that operates after reading in a class file for interpretation. It passes the class file to the JIT, which in turn compiles the bytecodes into native code for the platform. It may be faster to

do this than to just interpret the bytecodes. The JIT is an integral part of the Java Virtual Machine. Some environments allow a choice whether or not to permit JIT code

JVM

The Java Virtual Machine is the cornerstone of the Java programming language. It is the component of the Java technology responsible for crossplatform delivery. The JVM is an abstract computing machine and (just like a real computing machine) has a defined instruction set. The JVM knows nothing of the Java language, only of a particular file format, the class file format. A class file contains JVM instructions (or bytecodes) and a symbol table, as well as other required information

LDAP

Lightweight Directory Access Protocol is a protocol used for communicating with a directory product

L2TP

Layer 2 Tunneling Protocol is an emerging Internet Engineering Task Force (IETF) standard that combines the features of two existing tunneling protocols: Cisco's Layer 2 Forwarding and Microsoft's Point-to-Point Tunneling Protocol. L2TP is an extension to the Point-to-Point Protocol (PPP)

LER

The Label Edge Router is a router that sits at the boundary between an IP network and the MPLS domain. IP traffic is presented to an ingress LER, labels are pushed, and the resultant packets are forwarded over an LSP. LSRs carry the encoded packets and labels are swapped. At the egress edge of the MPLS domain, another LER removes all the MPLS encoding data, performs a normal IP lookup, and forwards the packet into the IP network

LSP

Label Switched Paths are often also referred to as tunnels. LSPs are used to transport data, such as IP packets, across an MPLS network. An LSP is a set of hops across a number of MPLS nodes. At the edge of the MPLS network, the incoming traffic is encapsulated in an MPLS frame and the latter is then routed, using the embedded label for addressing. The path traversed by an LSP can be specifically engineered for traffic so that different incoming traffic streams receive different service levels

LSR

Label Switching Router. In this book, an LSR is considered as a core device--that is, a node that resides inside the MPLS domain boundary and does no IP forwarding. An LER, on the other hand, performs the edge function: It applies the initial label to the packet after performing a conventional longest-match prefix lookup on the IP header. After the packet is labeled, the intermediate LSRs forward it using only the label. LSRs usually replace the label on an incoming packet with a new value as they forward it; thus, the forwarding mechanism is based on label swapping

MAP

Mobile Application Part is a protocol that utilizes SS7 to allow roaming and other mobile telephony capabilities, such as text messaging

MD5

Message Digest 5 is a standard algorithm that takes as input a message of arbitrary length and produces as output a 128-bit fingerprint or message digest of the input. Any modifications made to the message in transit can then be detected by recalculating the digest. Similar in concept to a CRC, the MD5 algorithm is used as part of the SNMPv3 security subsystem

MIB

A Management Information Base is a formal description of a set of objects that can be managed using SNMP. MIB-I refers to the initial MIB definition, and MIB-II refers to the current definition. There exist MIB extensions for each set of related management entities, such as the MPLS TE and LSR MIBs. Standard MIBs can be extended to include proprietary objects

MPLS

Multiprotocol Label Switching is a new technology designed to overcome some of the limitations of IP routing. IP packets are assigned to an FEC at the edge of the MPLS domain. This occurs just once in contrast to IP routing, where it occurs at every hop. The assigned FEC is encoded as a short, fixed-length value known as a label that is prepended to the packet. When the packet is forwarded to its next hop, the label is sent along with it, and there is no further analysis of the network layer header. Instead, the label is used as an index into a label information base table that specifies the next hop and a new label. The old label is replaced with the new label, and the packet is forwarded to its next hop. This process continues until the packet arrives at the outer edge of the MPLS domain, where the label is stripped off and a normal IP forwarding operation is executed. Labels are

flexible objects and can be included as part of sophisticated traffic engineering schemes; for example, a given label value can receive specific traffic handling

MTP

Message Transfer Part is the part of a common-channel signaling system (such as SS7) that transfers signal messages between network nodes and performs functions such as error control and signaling link security

MVNO

Mobile Virtual Network Operator is a relatively new breed of operator that uses the infrastructure of another operator to provide a competitive service. Unused capacity in the host network is sold to the MVNO and cross-selling of services may be possible

NAP

A Network Access Point is an Internet interconnection point that is used to tie all the Internet access providers together. NAPs provide switching facilities

NBI

Northbound Interface describes an interface offered by many NMS products. The NBI allows for NMS features, functions, and data to be accessed by an OSS. TMF-814 (from the TeleManagement Forum) is one standardized model for an NBI based on CORBA. The OSS can use the NBI to retrieve information from the NMS in any of the FCAPS areas. It is also possible for an OSS to automate many of the NMS functions, such as provisioning. In this way, an OSS can avoid the need for a network operator to use the GUI provided with the NMS. This can help facilitate integration of the NMS into an SP environment

NE

Network Element. This is a device that resides inside a managed network. Typically, an NE provides some services to a network operator, such as ATM or Frame Relay virtual circuits, MPLS, and IP. NEs host MIBs and the objects in these MIBs can be used by network management systems

NGN

Next-Generation Network is a generic term used to describe the emerging packet-based networks. Such networks feature mixed traffic types such as voice, video, and data, and each traffic type receives an appropriate class of service. Realizing such converged networks requires special-purpose technology in the network, such as MPLS

NHLFE

Next-Hop Label Forwarding Entry is a table that contains the next hop, the label value to be replaced, and the label stack to be added to an MPLS-encoded packet

NIC

Network Interface Card is a term used to describe a peripheral circuit board or card installed in a computer that facilitates connection to a LAN. NICs may implement networking technology such as ATM, Ethernet, or token ring. NICs connect to some shared medium, such as an Ethernet cable, or they may connect to a switch

NMS

Network Management System is a term that describes a computer-based software application suite dedicated to the management of networks of NEs. Typically, the NMS provides abstractions (such as signaling links and virtual connections) appropriate to the overall running of a network; that is, it is not exclusively concerned with the details of one NE. Communication between an NMS and NEs is typically executed via an EMS, where the latter may reside on the NE. Above the NMS, the OSS is found

NOC

Network Operations Center. A NOC is a location where a telecommunications or data network is managed. Enterprises with large networks as well as service providers may use the services of a third-party NOC. This shifts the burden of management onto the third party and serves to explicitly define the financial outlay required for managing the network

OID

Object Identifiers are strings of numbers organized in a hierarchical fashion. Every object in a MIB has a unique OID. The Internet OID is 1.3.6.1. The dot notation is an IETF invention, but the ITU preferred a notation using spaces and braces, with optional text labels, so that 1.3.6.1 would look like any one of the following:

```
{iso(1) org(3) dod(6) iana(1)}  
{1 3 6 1}
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OOD

Object-Oriented Design is a general field that seeks to provide an abstraction for software development based on

real-world objects

ORB

Object Request Broker is the software that functions as a broker (or intermediary) between a client request for a service from a distributed object or component and the completion of that request. Providing ORB support in a network means that client programs can request remote services without needing any knowledge concerning the location of the associated server. Likewise, it is not necessary for the client to have details of the interface to the server program

OSPF

Open Shortest Path First OSPF is an IP routing protocol used inside autonomous systems. OSPF is controlled by the IETF as one of several Interior Gateway Protocols (IGPs). With OSPF, a host that detects a change to its routing table (such as an interface going up or down) immediately transmits the information to all other OSPF hosts in the network. What then follows is a process called convergence in which all OSPF hosts try to build the same routing picture of the network. Routing and network management are conceptually similar in that both try to maintain parity between external dynamic entities. In the case of routing protocols, the external entity is network topology. In the case of network management, the external entity is the set of remote SNMP agents

OSI

Open Systems Interconnection is a complete suite of routing protocols developed by the International Organization for Standardization (ISO). OSI protocols include Intermediate System-to-Intermediate System (IS-IS), End System-to-Intermediate System (ES-IS), and Interdomain Routing Protocol (IDRP). Two important OSI networking terminology terms are nonrouting network nodes or end systems (ES) and routers or intermediate systems (IS). These two terms form the basis for the ES-IS and IS-IS OSI protocols. The ES-IS protocol enables ES and IS to discover each other. The IS-IS protocol provides routing between IS

OSS

Operations Support System refers to the system that handles workflows, management, inventory details, capacity planning, and repair functions for service providers. Typically, an OSS uses an underlying NMS to actually communicate with the network devices. It is also possible for an OSS to communicate directly with devices. In like fashion, the OSS is itself often used by the business support system

PBNM

Policy-Based Network Management technology provides the ability to define and distribute policies to manage enterprise and SP networks. Policies can reside either on devices themselves or in the network management system and exist to control essential network resources such as traffic engineering, bandwidth, and security

PDP

Policy Decision Point is an entity in a policy-based system where decisions are made. PDPs can be devices such as routers carrying out traffic handling

PDR

Performance Data Record (similar in concept to CDR) describes a block of data emitted by a network device to indicate some aspect of performance--for example, the number of IP packets sent or received. PDRs can be aggregated by external software to provide an overall picture of performance

PDU

Protocol Data Unit is an expression that describes the basic information element of a given protocol; for example, SNMP has various PDUs, such as get and get-next. The latter describe protocol operations and are encoded in the form of messages before being sent to another protocol entity

PEP

Policy Enforcement Point is an entity in a policy-based system where decisions are enacted. PEPs can be devices such as routers carrying out traffic handling

PHB

Per-Hop-Behavior is a way of describing the forwarding treatment experienced by a packet at each network node in a DiffServ domain. A bit pattern in each IP packet header, in the IPv4 TOS octet or the IPv6 Traffic Class octet, is used to mark a packet to receive a particular forwarding treatment, or per-hop behavior. The IETF has standardized a common layout for a six-bit field, called the DS (or Differentiated Services) field. RFC 2474 and RFC 2475 define the architecture and the general use of bits within the DS field (superseding the IPv4 TOS octet definitions of RFC 1349)

PIB

Policy Information Base is a virtual repository for policy information

PLC

Programmable Logic Controller is a device used to automate monitoring and control of industrial plant

PNNI

Private Network-To-Network Interface is an ATM Forum protocol that supports QoS and hierarchical operation in ATM networks. It supports routing and signaling in multivendor ATM networks. PNNI hierarchy is provided via peer groups--any nodes that share a given peer group ID elect a peer group leader, which then represents the peer group in the next level of hierarchy. Each PNNI node has a topology database that represents its view of the network. Signaling is used to create connections (e.g., SPVCCs) across the network

POP

Point-of-Presence is an access point to the Internet. A POP must have a unique IP address. An ISP has one or more points-of-presence on the Internet. A POP may reside in rented space owned by a telecommunications carrier (e.g., AT&T) to which the ISP is connected. A POP usually includes switches, routers, servers, and so on

POTS

Plain Old Telephone Service is a term often used to describe traditional telephone technology

PSTN

Public Switched Telephone Network PSTN is the complete set of global voice-oriented public telephone networks. Often referred to as the Plain Old Telephone Service (POTS), the PSTN is a vast aggregation of circuit switching telephone networks that spans the globe

PVC

Permanent Virtual Connections are software-created logical connections in a network such as ATM or Frame Relay. PVCs are generally created link-by-link and node-by-node in a set of manual steps. Once all the required PVCs have been created, it is possible for traffic to flow through the overall connection

PVX

This is the generic name for all Permanent Virtual Connection types. For ATM, these include PVPs and PVCs

QA

Quality Assurance is a group of people dedicated to testing software releases. Often amounting to half the total cost of a complex project, testing is a critical function. With development budgets increasingly squeezed, QA is often the last line of defense before customer releases

QoS

Quality of Service refers to the capability of a given network to provide preferential service to one type of traffic over another. It defines the ability of the network to deliver services other than, say, best effort (in the case of IP). A number of technologies, including ATM, Frame Relay, and MPLS, provide a degree of QoS such as priority, guaranteed bandwidth, and maximum burst size. In particular, ATM provides five service categories: CBR (constant bit rate used by connections that require a static quantity of bandwidth that is continuously available for the lifetime of the connection), rtVBR (real-time variable bit rate used by connections that require tightly constrained delay and delay variation, e.g., voice and video applications), nrtVBR (non-real-time VBR service category used by applications that are bursty in nature), ABR (available bit rate used by applications that can accommodate changes--subsequent to connection establishment--in the ATM layer transfer characteristics of the network), and UBR (unspecified bit rate used by non-real-time applications that do not require tightly constrained delay and delay variation). QoS is of increasing importance on layer 3 networks as time-constrained traffic grows

RADIUS

Remote Access Dial-In User Service is a combination of a client/server protocol and software that enables remote access servers to communicate with a central server for the authentication of dial-in users, virtual private network users, and wireless network users. RADIUS allows for the storage of user profiles in a central database for sharing by remote servers. A central service also makes the collection of statistics and usage data for billing easier to manage

RAS

A Remote Access Server is a combination of a computer and specific software that exists to provide remote network access to users. A RAS is often associated with a firewall to ensure security and may operate in conjunction with a router for forwarding the remote access requests to some other part of the network. A RAS may also be used as part of a virtual private network or a wireless network

RFC

Request for Comments is a series of notes maintained by the IETF concerning the Internet. RFCs cover a broad

range of topics with the principal focus on network protocols, procedures, programs, and concepts. RFCs are an indispensable tool for learning about Internet technology

RMI

Remote Method Invocation provides a means for invoking the methods of remote Java objects. The caller must first acquire a reference to the remote object, for example, by looking it up in the RMI bootstrap naming service or by receiving a reference as an argument or a method return value. Using the object reference, a call can be made on the remote server object. The server can in turn be a client of other remote objects. RMI technology uses object serialization to marshal and unmarshal parameters between method calls; it does not truncate types, supporting true object-oriented polymorphism

RPC

Remote Procedure Calls are made by software to functions hosted on remote machines. An RPC acts just like an ordinary function call except that it results in remote computation that occurs across a network in a transparent fashion. Parameters to the function call are passed across the network (a process called marshalling) to the called function; the remote function executes and returns a result. The result is then passed back across the network to the caller. All of this occurs in a transparent fashion

SAN

Storage Area Networks are a means of separating storage from both host machines and corporate networks. SANs deploy storage inside the boundary of a dedicated, high-speed network. A boundary device then manages (reads and writes) the storage. Some commentators feel that once an organization's storage needs pass the terabyte mark, it is time to start using SAN technology

SCCP

Signaling Connection Control Part is a component of the SS7 protocol suite that provides additional functions to those of the message transfer part (MTP). SCCP provides both connectionless and connection-oriented network services to transfer signaling information across telecommunication networks, such as GSM

SDL

Specification and Description Language is an object-oriented, formal language defined by the International Telecommunications Union-Telecommunications Standardization Sector (ITU-T) as recommendation number Z.100. SDL can be used intended for the specification of complex, event-driven, real-time, and interactive applications involving many concurrent activities that communicate using discrete signals. Typically, SDL programs consist of many state machines controlled by signals. SDL programs can also communicate with the outside world through various programming languages (e.g., C) via what are called environment modules. Execution speed of these state machines is very often extremely impressive and faster than handcrafted C code

SHA1

The US Secure Hash Algorithm takes a message of less than 264 bits in length and produces a 160-bit message digest designed so that it is computationally very expensive to find a text string that matches a given hash

SIN

Ships-in-the-Night allows for ATM Forum and MPLS control planes to both run simultaneously on the same hardware but isolated from each other; that is, they do not interact. The label space may be divided between the two technologies. SIN allows a single device to simultaneously operate as both an MPLS node and an ATM switch. This can be important when migrating MPLS into an ATM network

SLA

Service Level Agreement describes the performance provided to the customers of a given SP network. The items included in SLAs can include bandwidth, delay, uptime guarantees (anything from 0% to 99.999%), refund terms for SLA nonconformance, and so on. Some service providers provide Web-based facilities to allow customers to see how an SLA is being met. Other service providers provide reports on a monthly basis. An interesting trend is enterprise IT departments writing their own SLAs for their customers (other sites, divisions, and departments within the enterprise). These SLAs can then be measured and possibly even compared with an outsourced provider

SMS

Short Message Service is a service for sending text messages to GSM mobile phones. GSM and SMS service is primarily available in Europe. SMS is similar to paging, and in some countries paging networks have been replaced by SMS. SMS has experienced an amazing upsurge in popularity in Europe and is used extensively by young subscribers

SNMP

Simple Network Management Protocol is an IETF protocol used for network management. Even though SNMP is one of the TCP/IP protocols, it is not restricted to use in TCP/IP networks. The success of SNMP is mostly due to its simplicity and lightweight features. The managed objects supported by a given device are encoded in its MIB or schema description. SNMP entities include managers and agents (both proxy and non-proxy), and a simple messaging protocol is used between these entities. Operations from the manager side include set (modify) and get (retrieve), and agents can respond these with reference to a security framework. Agents can also issue notifications or traps to manager in order to indicate important events

SOAP

Simple Object Access Protocol is a lightweight protocol for exchanging information in decentralized, distributed environments. It is an XML-based protocol and consists of three parts: an envelope for describing what is in a message and how to process it, a set of encoding rules for expressing instances of application-defined data types, and a means of representing remote procedure calls and responses

SP

Service Providers are companies that provide data and telecommunications services to end users. SPs sell an increasingly broad range of services, including products for access, aggregation, and transport. An interesting trend for SPs is the provision of software application infrastructure, SANs, content delivery networks--putting servers near the network edge to minimize the effects of congestion in the first mile (server-to-backbone), backbone, peering points (between carriers), and in the last mile (network-to-end user). These relatively new service offerings move SPs out of the simple bandwidth reselling area into a more diverse and complex marketplace. The amount of (and diversity of, i.e., non-real time, time-constrained) traffic crossing SP networks is increasing all the time. Many of the larger SPs are planning for a single packet-based network, and MPLS is an excellent contender for helping fulfill this

SPPI

Structure of Policy Provisioning Information (RFC 3159) describes a provisioning model for policy information. The model views the policy information as a collection of provisioning classes and provisioning instances that reside in a virtual information store, termed the Policy Information Base (PIB). Collections of related provisioning classes are defined in a PIB module in a similar fashion to a MIB module. Just as for SNMP, PIB components can be written to (or read from) remote devices. The devices in turn implement any such policies

SPVCC

Switched Permanent Virtual Channel Connection describes a connection with fixed endpoints but switched in the middle. ATM provides two types of SPVCs: switched permanent virtual path connections (SPVPCs) and switched permanent virtual channel connections (SPVCCs). The switched component of these connection types allows for more resilience than is the case with PVCs because intermediate node or link failure results in possible rerouting rather than just failure

SPVX

This is the generic name for all Switched Permanent Virtual Connection types. These can be SPVPCs, SPVCCs, and so on

SS7

Signaling System Number 7 is a network architecture that separates the management of telephone networks from the actual call switching. SS7 provides many benefits because the SS7 software applications can reside in computers rather than telephone exchanges. This allows for a healthy separation between software vendors and switch/exchange manufacturers

TCAP

Transaction Capability Application Part is an SS7 protocol layer and allows applications to invoke software procedures at remote locations in an SS7 network. TCAP provides transaction and component handling capabilities as well as load sharing between multiple instances of the same application

TCP

Transmission Control Protocol (RFC 793) is used as a reliable protocol between hosts in packet-based communication networks. TCP is a connection-oriented, end-to-end reliable protocol that sends and receives variable-length segments of information. TCP is conceptually located between the end user on one side and IP on the other side. Users can push and pull segments via TCP in a reliable fashion with flow control. Multiplexing and demultiplexing is provided using a socket abstraction. TCP also allows the creation of connections between processes (similar in concept to the connections we've seen in this book)

TDM

Time Division Multiplexing is a method of transporting voice communications

TL1

Transaction Language One is a widely used telecommunications management protocol. TL1 is a vendor-independent and technology-independent man-machine language. TL1 facilities can be provided as part of an OSS for interacting with either underlying management systems or NEs. One popular application is for a management system (or NE) to package its trap/notification data in TL1 format and forward it to an OSS component. An OSS may also provide a TL1-based facility for sending commands to the lower layers

TLS

Transparent LAN Service describes a method of providing a LAN service from one enterprise customer site to another through an intermediate SP cloud. The technology inside the SP is irrelevant to the enterprise users because their focus is using the LAN service. The latter is supplied transparently via the SP

TMN

Telecommunications Management Network (defined in ITU M.3000 recommendation) provides a framework or model to support the management and deployment of telecommunications services. Methods are defined for managing networks using object-oriented principles, and standard interfaces facilitate communication between deployed management entities. The standard management interface for TMN is called the Q3 interface. Interoperability is a key aspect of TMN-compliant networks. TMN is based on the OSI network management framework and includes the familiar concepts of MIBs, agent, managers, and so on. TMN describes network management from a number of interdependent viewpoints including:

- A logical or business model
- A functional model
- A set of standard interfaces

TMN consists of a small number of components that combine to provide a powerful management capability

TOM

Telecommunications Operations Map is a model for representing common business processes from the customer's point of view. The TOM is independent of organizations, technologies, and services. It supports the implementation of end-to-end operations integration (often called flow-through operations) and automation. By modeling business processes, the TOM gives new service providers a starting point and existing service providers a reference point for the implementation and management of business-level processes. Management systems can then be built to support TOM. By using a common model, the overall business management systems can be more quickly developed and deployed. Also, it becomes easier to implement lower level management systems because interfaces are standardized

TOS

Type of Service (RFC 1349) is a single-byte field in an IP packet header that specifies the service level required for the packet. It is now called the DS field and can have the following values:

- Bits 0-2: Precedence
- Bit 3: 0 = Normal Delay, 1 = Low Delay
- Bit 4: 0 = Normal Throughput, 1 = High Throughput
- Bit 5: 0 = Normal Reliability, 1 = High Reliability
- Bits 6-7: Reserved for Future Use

UML

Unified Modeling Language is the industry-standard language for the specification, visualization, construction, and documentation of the components of software systems. UML helps to simplify the process of software design, making a model for construction with a number of different views. One of the great merits of UML is the way it helps open up the development process with what are called use cases. These serve to identify principal roles (actors) in the system, boundaries, actions, and so on. Software developers need not write use cases; instead, other stakeholders can provide them. Integrated tools allow for use cases to be incorporated into the development process

USM

User-based Security Model is an administrative framework (or security model) that defines the mechanisms used

to achieve a defined level of security for management protocol interactions (gets, sets, notifications, etc.). The USM for SNMPv2 defines a security model for this administrative framework that includes an access control model. The enforcement of access rights requires the means to identify the user who generates a network request. Data integrity protection is provided via a message digest algorithm. Authentication is provided via a secret value inserted into and appended to the message. Protection against message replay or delay is provided by time indicators and request-id counters

VCI

Virtual Channel Identifier is one of the header fields in an ATM cell. The VCI is assigned during the virtual connection setup and used by each switch for forwarding

VLAN

Virtual Local Area Network is a very flexible type of LAN in which machines located in the same physical area are not necessarily on the same LAN broadcast domain. VLANs can be implemented using sophisticated switches. Individual workstations are connected to switch ports (e.g., 10/100/1000Mbps), and it is the job of the latter to create the broadcast domain. VLANs can be of different types: port-based, MAC-based, or IEEE 802.1p/Q-based. Port-based VLANs relate to the switch port on which the end device is connected. MAC-based VLANs relate to the MAC address of the end device. 802.1p/Q-based VLANs use the contents of a 2-byte tag in the layer 2 header. Three bits are reserved for priority, and 12 bits are used for encoding VLAN IDs

VoIP

Voice-over-IP is a telephony term describing the facilities for managing the delivery of voice using IP. It involves sending voice information in some digital form in discrete packets rather than in the traditional circuit-oriented format of the PSTN. One advantage of VoIP is toll bypass--that is, avoiding the tolls charged for ordinary telephone service. Many organizations use VoIP internally over WAN links to reduce telephony service costs. Another cost saving is that VoIP leverages existing IP infrastructure and reduces the need for traditional telephony equipment (PABX, TDM phones, etc.)

VPI

Virtual Path Identifier is one of the header fields in an ATM cell. The VPI is assigned during the virtual connection setup and used by each switch for forwarding

WAN

A Wide Area Network is a geographically distributed telecommunications network. Often, a WAN is employed to interconnect LANs across a corporation. A WAN may be privately owned, leased, or rented, but normally includes some element of public networks

XML

Extensible Markup Language is a flexible (text-based) way of creating common information formats. XML facilitates the sharing of both format and data.