

# **Glossary of Communications Terms For Relay Engineers**

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## **Disclaimer**

This document has been prepared in order to give the Protective Relay Engineer an insight and understanding of communication terms that they may encounter in their work. It is not meant to be a substitute for or replace the IEEE Dictionary.

## **Glossary of Communications Terms For Relay Engineers**

### **AAL - ATM Adaptation Layer**

The standards layer that allows multiple applications to have data converted to and from the ATM cell. A protocol used that translates higher layer services into the size and format of an ATM cell.

### **ACCUNET Switched 56**

An AT&T digital service providing switched (dialup) digital service at 56 Kbps.

### **ACCUNET T1.5**

An AT&T tariffed data oriented digital service that provides leased end-to-end customer premises terminated T-1 links.

### **ACCUNET T1.5 Reserved**

A disaster recovery service whereby a switched 1.544 Mbps link is available between COs and is activated when AT&T is notified of the T-1 link failure.

### **ACCUNET T45**

An AT&T tariffed service that provides 45 Mbps, DS3 service which can carry 28 T-1 connections (672 voice channels).

### **ACD - Automatic Call Distributor**

A telephone facility that manages incoming calls and handles them based on the number called and an associated database of handling instructions.

### **ADPCM - Adaptive Differential Pulse Code Modulation**

A speech coding method which uses fewer bits than the traditional PCM (Pulse Code Modulation). ADPCM calculates the difference between two adjacent speech samples, typically using 4 bits/sample at 8000 samples per second resulting in a 32 kbps digital channel.

### **ADSL - Asymmetric Digital Subscriber Line**

Supports two-way transmission of voice, downstream data bandwidth up to 8 Mbps and an upstream data bandwidth of up to 640 Kbps. (Consumer usage is common.)

### **AGC - Automatic Gain Control**

A technique to control gain (amplification) in a control circuit, usually implemented as a feedback element in an electronic circuit.

### **AIM - ACCUNET Information Manager**

Provides end-to-end performance monitor using the ESF format for AT&T supplied T-1 service.

### **AIN - Advanced Intelligent Network**

A telephone network architecture that separates service logic from switching equipment, allowing new services to be added without having to redesign switches to support new services.

**AIS - Alarm Indicating Signal**

A code sent downstream indicating an upstream failure has occurred. Sometimes referred to as Yellow Alarm

**AMI - Alternate Mark Inversion**

Line-coding used with a T1 circuit where zeros are transmitted as zeros and ones are transmitted as pulses with alternating polarity.

**ANI - Automatic Number Identification**

A service that provides the receiver of a telephone call with the number of the calling phone.

**ANSI - American National Standards Institute**

The primary organization for fostering the development of technology standards in the United States.

**AO/DI - Always On/Dynamic ISDN**

Allows the BRI "D" channel to be used for low-speed data connection.

**ARDS - ACCUNET Reserved Digital Service**

Similar to ACCUNET Ti .5, Reserved, but extended to 384 Kbps and 768 Kbps rates.

**ARP - Address Resolution Protocol**

One of the many sub-protocols used with Internet Protocol (IP) for network management. This protocol is used by the IP interface drivers to resolve IP to network addresses.

**ARS - Automatic Route Selection**

A PBX system which provides routing of certain outgoing calls over the alternate trunk facilities, based on direct dialing numbers.

**ASCII – American Standard Code for Information Interchange**

This code assigns 8-bit words to represent the most common alphanumeric characters used in North American English including the alphabet in upper and lower case, numerals 0-9, and standard punctuation.

**ASP - Application Service Provider**

A company that offers software application capabilities to individuals or enterprises from centralized data centers via the Internet.

**ASCII - American Standard Code for Information Interexchange**

ASCII is the most common format for text files in computers and on the Internet. In an ASCII file, each alphabetic, numeric, or special character is represented with a 7 -digit binary number (a string of seven 0s or 1s). 128 possible characters are defined.

**ASDS - ACCUNET Spectrum of Digital Services**

AT&T's fractional T-1 service offerings.

**ASIC - Application-Specific Integrated Circuit**

A silicon chip designed for a special application, such as a particular kind of transmission protocol or hand-held computer.

**ATM - Asynchronous Transfer Mode**

A dedicated, packet switched technology that allows high-speed transmission of data through the use of small, fixed-length packets (cells). These cells are of 53 bytes, with 48 bytes being payload and the remaining 5 bytes for header information.

**A&B Leads**

Refers to additional leads typically used with a channel bank two-wire interface to certain types of PBXs.

**A&B Signaling**

A procedure used in T-1 transmission facilities in which one bit, robbed from each of the 24 sub-channels in every sixth frame, is used for carrying dial and control information.

**Adaptive Routing**

Routing that automatically adjusts to network changes such as altered traffic patterns or failures.

**Aggregate Card**

A circuit board that interfaces between a multiplexer and a T-1 link. It provides the allocation of bandwidth over a T-1 link.

**Aggregate Link**

See T-1 aggregate link.

**Alarm**

A signal generated when abnormal network conditions exist.

System Node Alarm - indicates abnormal Node conditions.

Major Alarm - indicates major abnormal conditions where service is disrupted or out.

Minor Alarm - indicates minor abnormal conditions where service is not disrupted.

Status Alarm - indicates information regarding the status of an action or event.

**A-law**

The PCM coding and companding algorithm used in Europe.

**Alternate Route**

A secondary or backup communications path. Used when normal routing is not possible or temporarily unavailable. It has the same origin and destination node, but a different transfer node than the primary route.

**Amplitude Modulation (AM)**

Information can be sent by modulating a waveform (carrier). If the modulating signal is applied to the amplitude of the carrier, it is AM.

**Analog**

Continuously varying electrical signal in the shape of a wave used for voice or data transmission.

**Analog Transmission**

The transmission of a continuous wave of signals to represent information values (e.g., human voice).

**Asynchronous Data Transmission**

A method of data transmission which allows characters to be sent at non-predetermined intervals by preceding each character with a start bit and ending each character with a stop bit.

**AT Command Set**

Developed by Hayes Microcomputer Products to activate features of an intelligent modem. These commands are entered in the customer's DTE keyboard. Each command is prefaced by an '\_T'. They control dialing, timers, error handling, and tests.

**Audio Decoder**

Converts a digital signal to an analog signal.

**Authentication**

The process of establishing an information source or users identity for secure transactions like virtual private networking.

**Average Pulse Density**

In T-1 Bipolar transmissions, refers to the number of one-pulses per zero-pulse. FCC Rules Part 68 requires 12.5% pulse density and no more than 80 consecutive zeros. AT&T Publication 62411 uses a formula and no more than 15 consecutive zero pulses.

**B8ZS - Bipolar 8-Zero Substitution**

A technique used to satisfy the ones density requirements of digital T-carrier facilities in the public network while allowing 64 Kbps clear channel data. Strings of eight consecutive zeroes are replaced by an eight-bit code representing two intentional bipolar pulse violations.

**B2B - Business-to-Business**

The exchange of products, services, or information between businesses rather than between businesses and consumers.

**BECN - Backward Explicit Congestion Notification**

A bit set by a Frame Relay network to notify an interface device (DTE) that congestion avoidance procedures should be initiated by the sending device.

**BER - Bit Error Rate**

The percentage of bits that have errors relative to the total number of bits received in a transmission usually expressed as ten to a negative power. For example, a transmission might have a BER of 10 to the minus six, meaning that out of 1,000,000 bits transmitted, one bit was in error.

**BERT - Bit Error Rate Test**

A procedure or device that measures the BER for a given transmission path.

**BGP - Border Gateway Protocol**

A protocol for exchanging routing information between gateway hosts (each with its own router) in a network of an autonomous system. BGP is often the protocol used between gateway hosts on the Internet.

### **BISDN - Broadband Integrated Services Digital Network**

Any circuit capable of transmitting more than one Basic Rate ISDN.

### **BMS - Bandwidth Management Service**

An AT&T service which provides prioritized reconfiguration of T-1 circuits at the CO as well as at the customers presence.

### **BOC - Bell Operating Company**

A term for any of the 22 original companies (or their successors) that were created when AT&T was broken up in 1983 and given the right to provide local telephone service in a given geographic area.

### **BONDING - Bandwidth ON Demand INteroperability Group**

This group develops the standard that provides for the aggregation of data from multiple ISDN calls into a coherent data stream.

### **BPS - bits per second**

A measure of speed in serial transmission, the number of binary 1s and 0s sent each second. Also use kbps for thousands of bits per second (bps), Mbps for millions of bits per second and Gbps for billions of bits per second.

### **BPV - Bipolar Pulse Violation**

A bipolar pulse with the same polarity as the preceding pulse. This is a violation of the Alternate Mark Inversion rule.

### **BRI - Basic Rate Interface ISDN**

A user to network interface consisting of two *64 kbps* bearer (B) channels and one 16 kbps signaling (D) channel. The "B" channels carry data, voice or video traffic. The "D" channel is used to set up calls on the B channels and carry packet data.

### **BAUD – Baudot**

A unit of signaling speed; Defines the number of signal events per second in data transmission. BAUD equals bits/sec (BPS) only when each signal event represents one bit. In modern data communication, one event commonly indicates several bits, in which case BPS > BAUD.

### **Bandwidth**

A range of frequencies between two defined limits expressed in cycles per second or Hertz (Hz). Also the information carrying capacity of a circuit.

### **Bipolar**

The predominant signaling method used for digital transmission services in which binary ones are represented by alternating positive and negative pulses and binary zeros remain at zero amplitude.

### **Bit**

A single binary digit, represented as a 1 or 0

### **Bit Rate**

The speed at which the bits are transmitted (e.g., 2400 bps).

### **Bit Stuffing**

In asynchronous systems, a technique used to synchronize asynchronous signals to a common rate before multiplexing.

### **Blocking**

A PBX term referring to the prevention of any station from receiving a connection because all possible paths in the network are in use.

### **Blue Signal**

An AT&T term for a signal generated by transmission equipment upon detection of a network problem. This blue signal (also called AIS for Alarm Indication Signal) does not initiate any downstream alarms.

### **Bridge**

In networks, a unit that connects between network segments providing protocol and data medium translation

### **Bursty / Burstiness**

Sporadic use of bandwidth that does not use the total bandwidth of a circuit 100 percent of the time.

### **Busy Out**

A PBX term referring to the process of making a circuit unavailable for use.

### **Bypass**

Any private networking scheme that accesses long-distance transmission facilities without going through the local exchange carrier (LEG). The process by which a connection passes through intermediate nodes between the call origin point and the destination point. Any aggregate can directly route any of its channels to a channel on any other aggregate in order to bypass local physical channels.

### **Byte**

An ordered group of 8 binary digits

### **Byte Stuffing**

The insertion of specific bytes of information into a stream of data to act as control characters for that stream of data.

## **CCIS - Common Channel Interoffice Signaling**



An AT&T method of separate channel signaling by which control and signaling for a group of (typically digital) trunks between telephone central offices is carried in a separate dedicated channel (currently being upgraded in the U.S. to Signaling System #7).

**CCITT - Consultative Committee International for Telegraphy and Telephony**

A European advisory committee established by the United Nations to recommend worldwide standards of transmission within the International Telecommunications Union (ITU).

**CCR - Customer Controlled Reconfiguration**

An AT&T service that lets users make changes in their digital access and cross connect (DACS) network configurations (at a DSO Level) either in real time or according to a preplanned schedule.

**CDMA - Code Division Multiple Access**

One of the three wireless telephone transmission technologies. After digitizing the data, it spreads it out over the entire bandwidth it has available. Multiple calls are overlaid over each other on the channel, with each assigned a unique sequence code.

**CDSL - Consumer Digital Subscriber Line**

A trademarked version of DSL that is somewhat slower than ADSL (1 Mbps downstream, probably less upstream) but has the advantage that a "splitter" does not need to be installed at the user's end.

**CEPT - Conference of European Postal and Telecommunications**

A European administrative body that makes recommendations for telecommunications practices within Europe.

**CFA - Carrier Failure Alarm**

The alarm which results from an out-of-frame or loss-of-carrier condition and which is combined with trunk processing to create a Carrier Group Alarm (CGA).

**CGA - Carrier Group Alarm**

A service alarm generated by a channel bank when an out-of-frame (OOF) condition exists for some predetermined length of time (generally 2.5 seconds). The alarm causes the calls using a trunk to be dropped and trunk conditioning to be applied.

**CIR - Committed Information Rate**

The committed rate (usually less than the access rate) which the carrier guarantees to be available to transfer information to its destination under normal circumstances for a particular Permanent Virtual Circuit (PVC).

**CLASS - Custom Local Area Signaling Services**

Number - translations services, such as call forwarding, available within the local exchange of a LATA.

**CLEC - Competitive Local Exchange Carrier**

A company that competes with the already established local telephone business by providing its own network and switching. The term distinguishes new or potential competitors from established local exchange carriers and arises from the Telecommunications Act of 1996 which was intended to promote competition among both long-distance and local phone service providers.

**CMIP - Common Management Information Protocol**

A network management protocol built on the Open Systems Interconnection (OSI) communication model. The related Common Management Information Services (CMIS) defines services for accessing information about the network objects or devices, controlling them, and receiving status reports from them.

### **CO - Central Office**

A center (normally a Class 5 office) where communications carriers terminate customer lines (subscriber local loops) and where switching equipment interconnects those lines. (See central office.)

### **COAX – Coaxial Cable**

A type of electrical cable with two conductors where one conductor surrounds the other, i.e., the two conductors share a common axis (coaxial). The outside conductor may shield the inner conductor from interference.

### **Compander - Compressor/Expander**

A device placed on a telephone circuit to compress the volume range at one point and expand it at another point, in order to improve the signal-to-noise ratio.

### **Comport - Communications Port**

A standard PC will have up to 4 communications ports but generally will only have COM1 and COM2 present in standard communications. This port can be used to connect a modem or a communications device to the PC.

### **Concatenated**

The linking together of various data structures, for example two bandwidths joined to form a single bandwidth.

#### **Concatenated STS-1**

A Synchronous Transport Signal (STS-NC), composed of n STS-1s combined. It is used to transport signals that do not fit into an STS-1 (51 Mbps) payload.

#### **Concatenated VT**

A virtual tributary (VT x Nc) which is composed of N x VTs combined. Its payload is transported as a single entity rather than separate signals.

### **CORBA - Common Object Request Broker Architecture**

An architecture and specification for creating, distributing, and managing distributed program 1 objects in a network through an interface broker.

### **CODEC - Coder/Decoder**

A device that converts analog signals to a digital form for transmission over a digital medium (typically voice to 64 Kbps digital) and back to analog after transmission.

### **COPS - Common Open Policy Service**

A proposed standard protocol for exchanging network policy information between a policy decision point (PDP) in a network and policy enforcement points (PEPs) as part of overall Quality of Service (QoS).

**COR - Central Office Repeater**

A T-1 line repeater based at the central office, also called an Office Repeater (OR).

**CoS - Class of Service**

A way of managing traffic in a network by grouping similar types of traffic together and treating each type as a class with its own level of service priority.

**CP / CPE - Customer Premises/Customer Premises Equipment**

In telephony, refers to the user's location and the equipment at that location that interfaces to the telephone network. It is also referred to as NCTE or (Network Channel Terminating Equipment).

**CPA - Customer Provided Access**

Refers to customer provided direct access to AT&T's ACCU NET T45 Point-Of-Presence.

**CRC - Cyclic Redundancy Check**

A method of checking for errors in data that has been transmitted on a communications link. A sending device applies a 16- or 32-bit polynomial to a block of data that is to be transmitted and appends the resulting cyclic redundancy code to the block.

**CRM - Customer Relationship Management**

An information industry term for methodologies, software, and usually Internet capabilities that help an enterprise manage customer relationships in an organized way.

**CSC - Common Signaling Channel**

A channel within a T-1 stream where the signaling information for all connections in that stream is sent.

**CSDC - Circuit-Switched Digital Capability**

See ACCUNET Switched 56.

**CSMA/CD - Carrier Sense Multiple Access with Collision Detection**

The protocol for barrier transmission access in Ethernet networks. On Ethernet, any device can try to send a frame at any time. Each device senses carrier to determine whether the line is idle or busy. If it is idle, the device begins to transmit its first frame. If another device has tried to send at the same time, a collision is said to occur which is detected by the transmitting devices. The frames are discarded and each device then waits a random amount of time to retry the same frame. They will continue to retry waiting longer random intervals after collisions until successful.

**CSP - Competitive Service Provider**

All companies in competition to deliver telecommunications services to both businesses and individuals.

**CSU - Channel Service Unit**

User owned equipment installed on customer premises at the interface between customer premises and the operating phone company to terminate a DDS or T-1 circuit. CSUs provide network protection and diagnostic capabilities.

### **CTI - Computer Telephony Integration**

The use of computers to manage telephone calls.

### **CTS - Clear-To-Send**

A control signal sent from the data communication equipment (DCE) to the data terminal equipment (DTE) in response to RTS (Request-To-Send) from the DTE; used to tell the DTE that the DCE is ready to transmit data.

### **CVSD - Continuously Variable Slope Delta-modulation**

A voice digitization technique programmed for 16, 32, or 64 Kbps.

### **Cache**

Content Service Providers (CSPs) pay to have their content "stored and kept fresh" at locations used by service providers. This technology is called "caching". It ensures that consumers will have a pleasurable experience in terms of updated material and quick response time; when they are looking up information or conducting an e-Commerce transaction.

### **Carrier**

1. A continuous frequency capable of being modulated with a second (information carrying) signal.
2. A communications company or authority providing circuits to carry private traffic (also known as common carrier).

### **C-Bit Parity**

Framing format for a DS-3 signal. This provides possibilities for in-service, end-to-end path performance monitoring of the DS-3 signal, and in-band data links.

### **Central Office**

A facility where communications common carriers (e.g., telephone companies) terminate customer lines and locate switching equipment that interconnects customer's lines. Also referred to as the CO, exchange, end office, or local Central Office.

### **Channel**

In communications, a path for transmission (usually both ways) between two or more points.

### **Channel Bank**

Equipment that performs TDM-type multiplexing of lower speed (generally voice converted to 64 Kbps digital) channels into a higher speed composite (generally in 24 channel groups of 1.544 Mbps each).

### **Channelized**

A circuit that is created by the multiplexing-demultiplexing voice and/or data bandwidth using analog or digital techniques.

### **Circuit**

In communications, a means of two-way communication between two or more points; usually a physical, metallic (e.g., telephone line) or fiber-optic path.

**Circuit switching**

A means of routing communications from an origin to a destination in which a circuit is established from the origin through switching points to the destination and is used exclusively for communications between the origin and the destination (a “call”) until the circuit is discontinued regardless of whether actual communication is taking place.

**Class X Office**

The designation of a telephone company switching facility; where Class 5 is an end office, Class 4 is a toll center, Class 3 is a primary center, Class 2 is a sectional center, and Class 1 is a regional center.

**Clear Channel**

The characteristic of a transmission path where the full bandwidth is available to the user. In T-1, 64 Kbps channels that do not require some portion of the channel (typically 8 Kbps) being reserved for carrier framing or control bits.

**Clock**

Precisely-spaced timing pulses used for synchronizing transmissions. A digital frequency source that generates the timing of a node.

**Co-location**

In telephone networks, the practice of installing foreign equipment (customer's or service provider's) on the central office premises.

**Common Carrier**

A government regulated company responsible for providing telecommunications services in a given territory that allow users, at a cost, access to communications.

**Common Channel Signaling System**

A signaling method using one of the channels on a multichannel link for the control, accounting, and management of traffic of all the channels of the link.

**Common Equipment**

Refers to the portion of a multiplexer or channel bank that is common to all channel units and required to support overall operation (i.e., transmit logic unit, DC power converters, or T-1 line interface units).

**Compression**

The application of any of several techniques that reduce the number of bits required to represent information on data transmission or storage, therefore, conserving bandwidth and/or memory.

**Connection**

The logical connection between two ports (origin port and destination port) over a network route that enables the exchange of data. Also the physical connection between two ports for exchange of data.

**Connection Types**

A type of connection is either dedicated (assigning a permanent connection) or virtual (assigning a temporary connection).

**Connectionless Protocol**

A protocol for data transmission where data can be sent from a unit to one or several other units with no indication as to whether the data is received (e.g. UDP)

**Connection-oriented Protocol**

A protocol for data transmission which requires the sending unit to confirm the presence of a receiving unit before sending data and the receiving unit to confirm reception of data for continued data transmission (e.g. TCP)

**Content**

Information carried across a given circuit, regardless of format.

**Contextual Value**

The significance or relevance that a piece of content or information on the Internet has to the individual end user.

**Cross-talk**

Unwanted transfer of energy from one circuit to another (typically adjacent).

**D1, D1D, D2, D3, and D4**

T-1 framing formats developed for channel banks. All formats contain a framing bit in every 193rd bit position.

**D4 Frame**

A frame format that consists of twelve frames (193 bits per frame). It provides end-to-end synchronization and signaling associated with a particular channel. In voice channels, Frames 6 and 12 use the eighth bit of each DSO voice channel to carry voice signaling information. Twelve D4 frames are also referred to as a Superframe.

**DACS - Digital Access and Cross-connect System**

A computerized or manual facility which allows DS1 (T-1) lines to be remapped electronically at the DSO (64 Kbps) level (also called DCS or DXS).

**DBU - Dial Back-Up**

A means of providing disaster recovery for a circuit that has failed.

**D-Banks**

Terminal equipment that multiplexes 24 digitized voice channels at 64 Kbps onto a single T-1 Aggregate Link.

**DCC - Data Communications Channels**

Overhead channels in SONET that enable communications between intelligent controllers and individual network nodes as well as inter-node communications.

**DCE - Data Communications Equipment**

A device which provides all the functions required for connection to local exchange carrier's lines and for converting signals between telephone lines and DTE.

**DDS - Dataphone Digital Service or Digital Data System**

A non-switched (dedicated) digital service network for data rates of up to 56,000 bits per second.

**DDS-SC - Dataphone Digital Service with Secondary Channel**

A tariff i.e. private-line service offered by AT&T and certain BOGs that allows digital data with a secondary channel that provides end-to-end supervisory, diagnostic, and control functions.

**DE - Discard Eligible**

A user-set mark indicating that a frame may be discarded in preference to other frames if congestion occurs, to maintain the committed quality of service within the network.

**DES - Data Encryption Standard**

DES is a published encryption algorithm which uses a 56-bit symmetric key to encrypt data in 64-bit blocks. The 56-bit key provides  $2^{56}$  or  $\sim 7.2 \times 10^{16}$  possible combinations.

**DHCP - Dynamic Host Configuration Protocol**

A protocol that lets network administrators manage centrally and automate the assignment of Internet Protocol (IP) addresses within an organization's network.

**DID - Direct Inward Dialing**

A service of a local phone company (or local exchange carrier) that provides a block of telephone numbers for calling into a company's Private Branch Exchange (PBX) system.

**DLC - Digital Loop Carrier**

Equipment that bundles a number of individual phone line signals into a single-multiplexing digital signal for local traffic between a telephone company central office and a business complex or other outlying service area.

**DLCI - Data Link Connection Identifier**

A 10-bit field within the address field which identifies the data link and its service parameters.

**DMZ - De-Militarized Zone**

A network added between a protected network and an external network in order to provide an additional layer of security. Usually used for the placement of Web or Email servers.

**DNS - Domain Name System**

System of computers (servers) that convert domain names to IP addresses.

**DOCSIS - Data Over Cable Service Interface Specification**

A project for the North American cable industry aimed at developing specifications for cable modems and associated equipment.

**DOE - Data Circuit-termination Equipment**

A device that maintains and terminates a connection between the data terminal equipment and the transmission facility (i.e., a modem).

### **DoS - Denial of Service**

A hacker attack designed for malicious purposes of disabling a server or network service by bombarding it with service requests, which prevents legitimate users from accessing the resource.

### **DS0 - Digital Signal Level 0**

A 64 Kbps standard digital telecommunications signal or channel. Often referred to as an individual channel on a T1, which consists of a total of 24 DS-0's or channels.

### **DS1 - Digital Signal Level 1**

The combination of 24 DS-0's creating a bipolar signal that is transmitted at 1.544 Mbps. Also called T1.

### **DS1C - Digital Signal Level 1C**

A 3.152 Mbps signal from a T-1 C multiplexer.

### **DS3 - Digital Signal Level 3**

A 44.736 Mbps signal consisting of 28 T-1 channels, from a T-3 multiplexer.

### **DSI - Digital Speech interpolation**

A technique for squeezing more voice conversations onto a trunk. DSI digitizes speech so that it can be cut into slices such that no bits are transmitted when a speaker is silent. As soon as speech begins, bits flow again.

### **DSLAM - Digital Subscriber Line Access Multiplexer**

A network device, usually at a telephone company Central Office, that receives signals from multiple customer DSL connections and puts the signals on a high-speed backbone line using multiplexing techniques.

### **DSP - Digital Signal Processor**

A specialized computer chip that performs a variety of complex operations on digitized signals. DSP works by clarifying or standardizing, the levels or states of a digital signal. A DSP circuit is able to differentiate between human-made signals, which are orderly, and noise which is inherently chaotic.

### **DSU - Data Service Unit**

A device used for interfacing Data Terminal Equipment (DTE) to the public telephone network. The DSU performs conversion of customer's data stream to bipolar format for transmission (i.e., DDS or T-1 when combined with a CSU). A short-haul, synchronous-data line driver, usually installed at a user location that connects user synchronous equipment over a 4-wire circuit.

### **DSX - Digital Cross Connect**

The standard patch panel access point found in Central Offices.

### **DSX-1 - Digital Cross-Connect**

Often used for connecting devices at 1.544 megabits. Also known as a short-haul DS-1 (655 feet). Often used with a PBx.

### **DSX-3 - Digital Signal Cross-Connect Level 3**



The designation for the DS3 point of interface (cross-connect).

**DTE - Data Terminal Equipment**

Terminals, printers, or computers which generate or receive information over the communications network.

**DTMF - Dual Tone Multi-Frequency**

The signal to the phone company that is generated when ordinary telephone touch keys are pressed. In the United States, this is known as "Touchtone" dialing.

**DVB - Digital Video Broadcasting Group**

A European organization responsible for the creation of a set of standards that define digital broadcasting using existing satellite, cable and terrestrial infrastructures.

**DWDM - Dense Wavelength Division Multiplexing**

A technology that puts data from different sources together on an optical fiber with each signal carried on its own separate light wavelength. Using DWDM, up to 80 (and theoretically more) separate wavelengths or channel of data can be multiplexing into a lightstream transmitted on a single optical fiber. In a system with each channel carrying 2.5 Gps, up to 200 billion bits can be delivered a second by the optical fiber. DWDM is also sometimes called Wave Division Multiplexing (WDM).

**Data**

A Digital representation of facts, concepts, or instructions.

**Datagram**

A message transmitted from origin to destination, generally by packet switching, without establishing a virtual circuit between the endpoints, provided on a "best efforts" basis by the network, and for which reliability is the responsibility of the communicating parties. Communication protocols that implement datagrams are also called "connectionless".

**Data Set Ready**

An EIA RS-232 control signal sent from a DCE to a DTE, used to tell the DTE that the DOE is ready for normal operation.

**Dedicated Connection**

A connection that is permanently allocated.

**Digital**

Information that has been binary encoded (a 1 or a 0).

**Digital Certificates**

A digital certificate is an electronic means to establish a users identity when establishing a virtual private network connection. It is issued by a certification authority (CA) and contains your name, a serial number, expiration dates, a copy of the certificate holder's public key (used for encrypting and decrypting messages).

**Downstream Link**

The T-1 link where node timing information is sent to a remote node. The remote node recovers its reference clock from this link.

**Drop and Insert**

Drop and insert refers to the capability to drop off specific DSO channels at a channel bank and insert DSO channels into vacated time slots.

### **Duplex**

A mode of data communications, where data can be sent both directions over a communication link.

1. **Half-duplex** - A mode of data communications, where data can be sent only one direction at a time over a communication link, requiring some kind of handshaking to synchronize sending and receiving at each end.
2. **Full-duplex** - A mode of data communications, where data can be sent both directions simultaneously over a communication link.

### **Dynamic Bandwidth**

A feature of T-1 networking multiplexers that allows the total bit Allocation rate of the multiplexers channels to exceed the bandwidth of the network trunks by assigning channels on the network trunks only to channels that are transmitting.

### **E&M Signaling**

Separate paths for signaling and voice signals. The "E" Lead (Ear) receives incoming signals as either ground or open condition. The "M" Lead (Mouth) sends ground or battery towards the switch.

### **E-1**

Refers to the CEPT standard for 2.048 Mbps transmission used in Europe.

### **ECSA – Exchange Carrier Standards Association**

An organization that specifies telecommunications standards for ANSI.

### **EIA - Electronic Industries Association**

A standards setting body comprised primarily of manufacturers. (See RS-232, RS-449, etc.)

### **EIA-232**

Electronic Industries Alliance- A 25-pin connector between the DCE and DTE.

### **EOC - Embedded Operations Channel**

A specialized channel that is imbedded into the overhead associated with synchronous transmission at the DS3 rate.

### **ESF - Extended Superframe Format**

A framing format that extends the D4 framing format from 12 frames to 24 frames and uses modified framing bits to provide a CRC, secondary channel, and data link.

**ESP - Encapsulated Security Payload**

The ESP provides confidentiality for packets, which are the message units that the Internet Protocol deals with and that the Internet transports, by encrypting the payload data to be protected.

**ESS - Electronic Switching System**

One of a family of AT&T manufactured, stored program control, central office switches. The most common are the IESS, 1AESS, 4ESS, and 5ESS switches.

**Echo Cancellation**

A device that support this technique provides filtering of unwanted signals that are called "echoes" This technique is typically used for voice applications over packet-based networks.

**Encryption**

Scrambling data in such a way that it can only be unscrambled through the application using a special key.

**End Office**

A local exchange office where the user's loop terminates (Class 5 telephone office).

**External Clock**

An external clock source where the master node reference clock is frequency locked to accept it. Allowable clock rates are any valid channel speed. Primary and secondary sources may be defined for redundancy. Used mainly for multi-tier configurations.

**FCC - Federal Communications Commission**

The U.S. government regulatory agency established in 1934 for the regulation of all interstate radio and electronic communications.

**FCC Rules, Part 15**

The FCC rules regulating the emission of electromagnetic radiation from electronic equipment.

**FCC Rules, Part 68**

The FCC rules regulating the direct connection of non-telephone company provided equipment to the public telephone network.

**FDDI - Fiber Distributed Data Interface**

An ANSI standard for fiber optic links with data rates up to 100 Mbps.

**FDL - Facilities Data Link**

An out-of-band, 4 kbit management path, available on ESF T-1s.

**FDM - Frequency Division Multiplexing**

An analog transmission system where each channel operates on a different frequency and all channels are transmitted together as an aggregate.

**FECN - Forward Explicit Congestion Notification**

A bit set sent by a Frame Relay network to notify an interface device (DTE) that congestion avoidance procedures should be initiated by the receiving device.

**FERF – Far End Receive Failure**

A signal to indicate to the transmit site that a failure has occurred at the receive site.

**FOTS – Fiber Optic Transmission System**

An acronym to designate the optical network

**FRAD - Frame Relay Access Device**

A generic name for a device that multiplexes and formats traffic for entering a Frame Relay network.

**FT1 - Fractional T-1**

A portion of a T-1 circuit. A full T-1 circuit has a capacity of 1.544 Mbps composed of twenty-four (24) 64 kbps channels. A customer may lease a portion of the full circuit to effect cost - savings. A fractional T-1 can only be configured in increments of 64 kbps or a certain number of channels.

**FX - Foreign Exchange**

A service that connects a customer's location via leased lines to a remote exchange, providing the customer with local service at local rates.

**FXO - Foreign Exchange Office**

Office side of a Foreign Exchange.

**FXS - Foreign Exchange Station**

Station side of a Foreign Exchange.

**Fiber Optics**

An optical transmission medium that consists of thin, plastic (or glass) strands which reflect light pulses within their interior along their length as a means to transmit large amounts of data.

**Fiber To The Curb**

Refers to the installation and use of fiber optic cable directly to the curbs near homes or any business environment as replacement for "plain" old telephone service.

**Firewall**

A security device that establishes a barrier to contain designed network traffic within a specified area by allowing or denying access.

**Flow Control**

A procedure for controlling the rate of data transfer between two points in the network.

**Format**

An arrangement of bits of characters within a group, such as a word or message.

**Fractional T-1**

Fractional T-1 provides for the transportation of subsets (or fractions) of a 1.544 Mbps T-1 digital data stream. The service, as tariffed, allows users to purchase bandwidth "by the DSO", rather than full T-1 circuits. ASDS offers fractional services in increments of 64, 128, 256, 384, 512, and 768 Kbps.

**Frame Relay**

A Layer 2, Packet-Based, carrier-switching technology. It provides features and benefits of a dedicated DDS or T1 network, but without the expense of multiple dedicated circuits.

**Framing**

The process of delimiting the bit groupings representing one or more channels from a continuous stream of bits.

**Frequency Modulation (FM)**

Information can be sent by modulating a waveform (carrier). If the modulating signal is applied to the frequency of the carrier, it is FM.

**Frequency Shift Keying (FSK)**

The modulation of the frequency of a carrier signal by an input signal. This is the same process as used for FM, but this term is used when the input signal comprises a digital signal (alternating between two voltages).

**GUI - Graphical User Interface**

A user interface that substitutes graphics for characters.

**Groom/Fill**

In telephony, terms associated with more efficient use of T-1 trunks by combining partially filled input T-1 trunks into fully filled outgoing trunks.

**Ground Start**

A telephony term describing a signaling method whereby one station detects that a circuit is grounded at the other end indicating an offhook condition.

**HDLC - High level Data Link Control**

A group of protocols or rules for transmitting data between network points (sometimes called nodes). In HDLC, data is organized into a unit (called a frame) and sent across a network to a destination that verifies its successful arrival.

**HDSL - High-bit-rate Digital Subscriber Line**

This employs a 2BIQ modulation technique across the same type pairs traditionally encountered with metallic T1 delivery systems. This satisfies Telco distance requirements without the use of repeaters. (Usually used in a campus environment.)

**HDSL2 - High-bit-rate Digital Subscriber Line version 2** (also known as g.SHDSL or SHDSL)

Allows service providers to deliver full T-1 and possibly E-1 over a single twisted pair.

**HFC - Hybrid Fiber Coax**

A telecommunication technology in which fiber optic cable and coaxial cable are used in different portions of a network to carry broadband content (such as video, data, and voice). Using HFC, a local cable TV company installs fiber optic cable from the cable head-end (distribution center) to serving nodes located close to business and residential users and from these nodes uses coaxial cable to individual businesses and homes.

**HIPPI - High Performance Parallel Interface**

A method of delivering high-speed point-to-point data between supercomputers or high-end workstations and peripherals.

**HSSI - High Speed Serial Interface**

A serial interface operating up to 52 Mbps and up to 50 ft.

**High-Capacity Terrestrial Digital Service**

Refers to tariffed, digital transmission service at T-1 rates (1.544 Mbps). (See ACCUNET.)

**IAD - Integrated Access Device**

A device which supports voice, data and video streams over a single high-speed connection.

**IDF – Intermediate Distribution Frame**

A freestanding or wall-mounted rack for managing and interconnecting the telecommunications cable between end-user devices and a Main Distribution Frame (MDF).

**IDSL – ISDN Digital Subscriber Line (2BIQ ISDN without dial-up capabilities)**

A symmetric DSL service that can transmit and receive data up to 144 Kbps.

**IEC or IXC Interexchange Carrier**

Any carrier registered with the FCC that is authorized to carry customer transmissions between LATAs. The links may be interstate or intrastate, if approved by a state public utility commission. Interexchange carriers include carriers such as AT&T Communications (formally AT&T Long Lines), MCI, and US Sprint).

**IKE – Internet Key Exchange**

A protocol whose purpose is to negotiate and provide authenticated keys for security associations in a protected manner. Processes which implement this protocol can be used for negotiating virtual private networks (VPNs) to a secure host or network.

**ILEC – Incumbent Local Exchange Carrier**

A telephone company in the United States that was providing local service in a specific geographic area when the Telecommunications Act of 1996 was enacted. ILECs include the former Bell operating companies which were grouped into holding companies known collectively as the Regional Bell Operating Companies (RBOC) when the Bell System was broken up by a 1983 consent decree.

**IP – Internet Protocol**

The method or protocol by which data is sent from one computer to another on the Internet. Each computer (known as a host) on the Internet has at least one IP address that uniquely identifies it from other computers on the Internet.

**IP Billing – Internet Protocol Billing**

The solution that allows Internet service providers to understand the amount of time their clients are consuming and enables them to bill clients on a consumption basis. Prior to IP Billing, service providers had only flat -rate billing capabilities.

**IPSec**

A developing standard for security at the network or packet processing layer of network communication. Earlier security approaches have inserted security at the application layer of the communications model. IPSec will be especially useful for implementing virtual private networks and for remote user access through public connection to private networks.

**IPX – Internet Packet eXchange**

Proprietary Novell Network Protocol used to move data between programs running on different nodes of the network.

**ISDF – Integrated Service Development Framework**

A set of CCIT/ITU standards for digital transmission over ordinary telephone copper wire as well as over other media. Home and business users who install an ISDN adapter (in place of a modem) can see highly-graphic web pages arriving very quickly (up to 128 Kbps).

**ISDN - Integrated Services Digital Network**

An International Telecommunications Union (ITU) standard of operating parameters and interfaces for a network that will allow a variety of mixed digital transmission services to be accommodated. Access channels include a basic rate (two 64 Kbps “B” channels + one 16 Kbps “D” channel) and a primary rate (23 64 Kbps “B” channels and one 64 Kbps “D” channel).

**ISO – International Standards Organization**

International Standards Organization- Group responsible for the creation of a set of CCIT/ITU standards for digital transmission over ordinary telephone copper wire as well as over other media.

**ISP – Internet Service Provider**

A company that provides individuals and/ or businesses access to the Internet and other related services such as web site building and virtual hosting. An ISP has the equipment and the telecommunication line access required to have POP on the Internet for the geographic area served.

**IVDT - Integrated Voice Data Terminal**

One of a relatively new family of devices that features a terminal keyboard/display and voice instrument. Many contain varying degrees of local processing power, ranging from full personal computer capacity to directory storage for automatic telephone dialing. They can be designed to work with a specific customer premises PBX or else be PBX independent.

### **IXC – Inter-eXchange Carrier**

A telephone company that provides connections between local exchanges in different geographic areas as described in the Telecommunications Act of 1996.

### **Internal Clock Source**

A multiplexer internal crystal clock oscillator source. This clock source may be selected as the master node reference clock that provides the timing reference for a transmission link.

### **Interleave**

The ability of SONET to mix together and transport different types of input signals in an efficient manner, thus allowing higher-transmission rates.

### **Isochronous**

Refers to asynchronous equipment communicating synchronously by use of a normally external clocking device.

### **Jitter**

The slight movement of a transmission signal in time or phase that can introduce errors and loss of synchronization in high-speed synchronous communications.

### **Kbps – Kilobits per second (one thousand bits per second)**

A measure of bandwidth (the amount of data that can flow in a given time) on a data transmission medium. Higher bandwidths are more conveniently expressed in Megabit per second (Mbps or millions of bits per second) and in Gigabits per second (Gbps, or billions of bits per second).

### **Key**

In cryptography, a key is a unique value that is applied to encrypt and/or decrypted data. The length of a key generally determines how difficult it will be to decrypt

the data. Both Public and Private keys are available and can be used together known as asymmetric encryption. A system for using just public keys is called a public key infrastructure (PKI).



**LAN – Local Area Network**

A group of computers and associated devices that share a common communications line and typically share the resources of a single processor or server within a small geographic area.

**LATA – Local Access and Transport Area**

A term for a geographic area covered by one or more local telephone companies, which are legally referred to as local exchange. Inter-LATA service is provided by long distance (interexchange) carriers.

**LBRV - Low Bit Rate Voice**

Refers to the ability to transfer voice channels at a lower speed than 64 Kbps, by using some compression or modulation technique other than PCM (i.e., ADPCM at 32 Kbps).

**LDN – Listed Directory Number**

Your seven digit phone number hence, the number that would be listed in the phone directory.

**LEC – Local Exchange Carrier**

The term for a telephone company that provides local service.

**Link**

A physical interconnection between two nodes in a network that operates at a 1-1 rate. (See T-1 Aggregate link.)

**LMDS – Local Multipoint Distribution System**

A system for broadband microwave wireless transmission direct from a local antenna to homes and businesses within a line-of-sight radius. A solution to the so-called last-mile technology problem of economically bringing highbandwidth services to users. LMDS is an alternative to installing optical fiber all the way to the user or to adapting cable TV for broadband Internet service.

**LS - Loop Start**

The most commonly used method of signaling an off-hook condition between an analog phone set and a switch. Picking up the receiver closes a wire loop, allowing DC current to flow, which is detected by a PBX or local exchange, and interpreted as a request for service.

**L2TP – Layer 2 Tunneling Protocol**

An extension of the Point-to-Point Tunneling Protocol (PPTP) used by an Internet Service Provider (ISP) to enable the operation of a Virtual Private Network (VPN) over the Internet.

**Leased Line**

A dedicated circuit, typically supplied by the telephone company or transmission authority, that permanently connects two or more user locations and is for the sole use of the subscriber. Such circuits are generally voice grade, in capacity and in range of frequencies supported, are typically analog, are used for voice or data, can be point-to-point or multipoint, and can be enhanced with line conditioning. Also called private line.

**Local Loop**

Wires that run from the user's phone set, PBX, or key system to a telephone company's central office.

### **Loop Current**

The current from a battery at a central office switch formed by the closure of the phone hook switch. It is the presence or absence of the current that enables the automatic equipment in the central office to observe the phone set's operation status.

### **MAN – Metropolitan Area Network**

A network that interconnects users with computer resources in a geographic area or region larger than that covered by a large local area network, but smaller than the area covered by a wide area network. It typically extends as far as 50-kilometers and operates at speeds between 1 Mbps to 200Mbps.

### **Mbps – Million bits per second**

The measure of bandwidth (the total information flow over a given time) on a data transmission medium such as twisted-pair copper cable, coaxial cable, or optical fiber line.

### **MIPS – Millions of Instructions Per Second**

A general measure of computing performance and, by implication, the amount of work a larger computer can do. Generally, this refers to the number of instructions that can be processed by the CPU in a given second.

### **MTBF – Mean Time Between Failure**

A measure of how reliable a hardware product or component is. For most components, the measure is typically in thousands or even tens of thousands of hours between failures.

### **MTU – Maximum Transmission Unit**

The largest unit of data that can be sent across a given medium.

### **Major Alarm**

An AT&T designation for an alarm indicating a service-affecting failure.

### **Master Clock**

The reference clock that is designated (arbitrarily) as the timing reference for the entire network. It generates timing signals for the control of other clocks and is located at the master timing node.

### **Master Timing Node**

A node that contains the master clock as its node reference clock. This node provides timing for all nodes within a synchronized network.

### **Mediation**

An old style or legacy system used in the telecom world that refers to the conversion of various telephone properties into a standard Call Detail Record (CDR).

### **Megabyte**

Specifically one million bytes, commonly used to indicate 1,048,576 bytes.

### **MEGACOM**

An AT&T service which allows conventional switched WATS to be provided via dedicated T-1 access facilities, bypassing the local exchange carrier (LEG). Integrated voice and data transmission can be terminated in the CO by a T-1 link and requires dedicated facilities between the customer's premises and AT&T CO (at the point of presence).

### **Message switching**

A method of communication in which messages are sent in their entirety from network node to network node, being stored at each node until completely received and then forwarded to the next node until the message arrives at its destination. While being transmitted, the entire message must be buffered at each intermediate node and enjoys dedicated use of the communication link between each pair of nodes, blocking all other communications on that link until completely transmitted.

### **Minor Alarm**

An AT &T designation for an alarm indicating a failure that does not affect service.

### **Mu-law**

The PCM coding and companding standard used in Japan and North America.

### **Multiplexing**

Transmission of multiple signals over a single channel.

### **MX3**

A designation for a multiplexer which connects 28 DS1s to one DS3 circuit (M13) or seven DS2s to one DS3 circuit (M23).

### **M12**

A designation for a multiplexer which connects four DS1 S to one DS2 circuit.

### **M13**

A designation for a multiplexer which connects 28 DS1s to one DS3 circuit.

### **M24**

A T-1 service that allows a user to multiplex up to 24 voice or data channels into a single T-1 link, compatible with AT&T central office based channel banks. M24 compatibility generally refers to compliance with the channelization and coding techniques specified by AT&T in Technical Publication 62411.

### **M34**

A designation for a multiplexer which connects six DS3s to one DS4 circuit.

### **M44**

A T-1 service that allows up to 44 voice channels (48 without signaling) to operate over a single T-1 link by using ADPCM.

**NAT – Network Address Translation**

The translation of an IP address used with one network to a different IP address that is known within another network. One network is designated as the inside network and the other is the outside.

**NCC - Network Communications Center**

The location designated as the focal point of controlling the network for centralized network diagnostics and management. All alarms are directed to the NCC.

**NE – Network Elements**

In SONET, the five basic network elements are add/drop multiplexer, broadband digital cross-connect, wideband digital cross-connect, digital loop carrier, and switch interface.

**NEBS – Network Equipment Building Standards**

NEBS testing is required for vendors who wish to sell equipment to the Regional Bell Operating Companies (RBOCs) and the Competitive Local Exchange Carriers (CLECs). Level 3 testing is the most stringent level of testing.

**NEXT – Near End Crosstalk**

An error condition that can occur when connectors are attached to twisted pair cabling. NEXT is usually caused by crossed or crushed wire pairs. The error condition does not require that the wires be crushed so much that the conductors inside become exposed. 1Wo conductors only need to be close enough so that the radiating signal from one of the wires can interfere with the signal traveling on the other.

**NNI – Network to Network Interface**

The connection between two public service network providers.

**NRZ - Non Return to Zero**

A binary encoding scheme in which ones and zeroes are represented by opposite high and low voltages and where there is no return to a zero (reference) voltage between encoded bits.

**NRZI - Non Return to Zero Inverted**

A binary encoding scheme that inverts the signal on a zero and leaves the signal unchanged for a one (also called transition coding).

**NOC – Network Operations Center**

A place from which a telecommunications network is supervised, monitored, and maintained. Enterprises with large networks and large network service providers such as GTE Internetworking typically have a network operations center.

**NT-1 – Network Termination Type 1**

A Basic Rate ISDN-only device that converts a service provider's U-Interface to a customers *S/T* interface. It can be stand-alone or integrated into a terminal adapter.

**Nx56/64 – N by 56 or 64 Kbps**

The v.35 interface on communication equipment is "Nx". More than one 56 or 64Kbps channel can be assigned to that interface.

**Network**

In telecommunications, it usually refers to infrastructure that provides for user voice and data transmission.

### **Network Interface (NI)**

The demarcation point of equipment and service responsibility between the telephone company and the customer.

### **Network Topology**

The physical and logical relationship of nodes in a network the schematic arrangement of the links and nodes of a network (i.e., star, ring, tree, or bus topology).

### **Node**

A point where multiple links are joined by communications equipment.

### **Node Reference Clock**

A clock source selected within a node that provides the timing reference for all other clocks within the node. The reference clock can be generated from the internal clock, recovered T-1 link clock, synchronous port clock, or external clock sources.

### **Non-Blocking**

A device which can support a full traffic load without experiencing congestion. The term is typically applied to a switch. In a non-blocking, all ports can run at full wire speed without any loss of packets or cells.

### **OAM – Operations, Administration, and Maintenance.**

Also called OAM&P.

### **OAM&P – Operations, Administration, Maintenance, and Provisioning**

Provides the facilities required to remotely manage a network.

### **OCC - Other Common Carrier**

Specialized common carriers (SCCs), domestic and international record carriers (IRC), and domestic satellite carriers (DOMSAT) that provide communications services. The term distinguishes the OCCs from AT&T and the independent telephone carriers.

### **OCU - Office Channel Unit**

A device used at the central office to terminate DDS circuits. It performs functions similar to the CSU at the customer's premises.

### **OC- N - Optical Carrier Level N**

These are fundamental transmission rates for SONET with N=1, 3, 9,12,18,24,36, or 48.

### **OCUDP - Office Channel Unit Data Port**

Provides signal conversion from any rate of a customer's access line (Le. TI) to a 56 or 64Kbps single DDS line. This is often used with a DDS or a SW56 DSU/CSU.

**OPX - Off Premise Extension**

The ability to have local access to a remote site (dial an extension) across a Wide Area Network link.

**OR - Office Repeater**

A device at the central office which terminates a T-1 line and regenerates the T-1 signal for routing and switching around the CO.

**OSI – Open Systems Interconnection (Seven-Layer Model)**

A standard architecture for data communications. Layers define hardware and software required for multi-vendor information processing equipment to be mutually compatible. The seven layers from lowest to highest are: physical, link, network, transport, session, presentation, and application.

**OSPF - Open Shortest Path First**

A router protocol used within larger autonomous system networks in preference to the Routing Information Protocol, an older routing protocol that is installed in many of today's corporate networks.

**OSS - Operations Support System**

An application program that helps someone monitor, control, analyze and manage problems with a telephone or computer network.

**Optical Power Budget**

In a fiber-optic communication link, refers to the allocation of available optical power (expressed in dB) among various loss-producing mechanisms such as coupling loss, fiber attenuation, splice losses, and connector losses, in order to ensure that adequate signal strength is available at the receiver.

**Orderwire**

A channel used to communicate between nodes in a network.

**Origin**

The designation for the port that requested the connection.

**Overhead Bits**

Bits in a serial data stream assigned for the use of the communication equipment and not available for payload. Overhead bits are used for functions associated with transporting the payload such as switching and network management.

**PABX - Private Automatic Branch Exchange**

See PBX.

**PBX - Private Branch Exchange**

A private telephone exchange connected to the public telephone network on the user's premises.

**PCM - Pulse Code Modulation**

A voice digitization technique programmed for 64 Kbps per voice channel. The signals in PCM are binary; that is, there are only two possible states represented by logic 1 (high) and logic 0 (low).

**PCS - Personal Communications Service**

A wireless phone service somewhat similar to cellular telephone service, but emphasizing personal service and extended mobility. It is sometimes referred to as digital cellular (although cellular systems can also be digital). Like cellular, PCS is for mobile users and requires a number of antennas to blanket an area of coverage.

**PKI - Public Key Infrastructure**

PKI enables users to privately exchange data through a public infrastructure like the Internet, through the use of a public and a private key pair that is obtained and shared through a trusted authority.

**PLAR - Private Line Automatic Ringdown**

PLAR is a type of signalling used with telephone-based intercom systems.

When a device is taken off-hook, it applies a ringing voltage to the circuit causing other devices on the same copper-pair to ring. When another telephone is answered, a call will be established and maintained.

**PON - Passive Optical Network**

A system that brings optical fiber cabling and signals all or most of the way to the end user. Depending on where the PON terminates, the system can be described as Fiber-To-The-Curb (FITC), Fiber- To- The- Building (FITB), or Fiber- To- The- Home (FITH) .

**POP - Point-of-Presence**

A physical layer within a LATA at which an inter-LATA carrier establishes itself for the purpose of obtaining LATA access. The local telephone company terminates subscriber circuits for long distance dialup or leased line communications at the POP.

**POTS - Plain Old Telephone Service**

Analog, voice-only telephone service.

**PPP - Point-to-Point Protocol**

A protocol for communication between two computers using a serial interface, typically a personal computer connected by phone line to a server. This protocol is typically used for Internet connections originating from a dial-up line and a high-speed modem.

**PPTP - Point-to-Point Tunneling Protocol**

A protocol that allows corporations to extend their own corporate network through private "tunnels" over the public Internet.

**PRI - Primary Rate Interface**

ISDN- A user to network interface consisting of 23 64Kbps bearer (B) channels and one 64Kbps signaling (D) channel earned over a 1.544Mb/s DS-I circuit. The "B" channels carry data, voice or video traffic. The "D" channel is used to set up calls on the B channels and carry packet data.

**PSTN - Public Switched Telephone Network**

The domestic telecommunications network commonly accessed by ordinary telephones, key systems, PBX trunks, and data equipment.

### **PVC - Permanent Virtual Circuit**

The logical connection between two nodes. Each PVC is assigned a CIR. A PVC can burst up to the port speed.

### **Packet**

A collection of data bits that are transported together through a communication link. Usually comprising a header (with address and length etc.), a payload, and a trailer.

### **Packet switching**

A means of routing messages from origin to destination in which the message is broken up into segments of limited length called packets. The segments are separately transmitted, possibly by separate network routes, from the origin through switching points to the destination in a manner similar to message switching. The segments are reassembled at the destination into the original message. It is essentially a modified form of message switching, developed to overcome the delay, buffering, and blocking issues that arise under message switching when long messages are transmitted

### **Parity**

Parity of a defined collection of bits is determined by counting the number of bits set to "1." Parity is said to be even if the number of bits set to "1" is even and odd if the number of bits set to "1" is odd.

### **Payload**

The portion of the bandwidth available to carry service signals.

### **Peer To Peer**

A type of network in which each workstation has equivalent capabilities and responsibilities. This differs from client/server architectures, in which some computers are dedicated to serving the others.

### **Phase Modulation (PM)**

Information can be sent by modulating a waveform (carrier). If the modulating signal is applied to the phase of the carrier, it is PM.

### **Phase Shift Keying (PSK)**

The modulation of the phase of a carrier signal by an input signal. This is the same process as used for PM, but this term is used when the input signal comprises a digital signal (alternating between two voltages).

### **Plesiochronous**

Nearly synchronized, a term describing a communication system where transmitted signals have the same nominal digital rate but are synchronized on different clocks.

### **Point-to-Point Configuration**

Communications system where channel(s) are available between only two equipment locations or nodes.

### **Port**



1. The physical connection between a device and a circuit. It's capacity determines the greatest amount of data that can be transmitted at any given time.
2. A 16-bit integer used by Internet Protocol (IP) identify the where to deliver data. Port numbers 0-1023 are reserved for assigned applications, and 1024-65535 are available for user applications. The IP suite transfers data between hosts based on IP addresses and distributes data to processes and applications on a host based on the port number.

### **Port**

One (usually of many) signal interfaces to a device. This may be physical, e.g. ports on an Ethernet switch; or logical, e.g. the 16-bit-address UDP/IP and TCP/IP ports on a processor.

### **PPP - Point-to-Point Protocol**

A term used by the internet community for direct links between two devices. e.g. the IETF's RFC 2516 describes Point-to-Point Protocol over Ethernet (PPPoE).

### **Precision Time Protocol**

A moniker used by the IEEE 1588 standard (for its protocol). The IEEE 1588 standard provides a technology for the distribution of time over communication networks; its claim to fame being an ability to provide sub-microsecond timing accuracies.

### **Primary Route**

The initial route that is established as the communication path.

### **Pseudo Random Bit Sequence**

A data stream for testing the bit error performance of a data link; it has a known pattern (to allow error checking) but has almost the same statistics as a random bit stream (for stressing the data link with all bit-sequence combinations).

### **Pulse Stuffing**

The introduction of a pulse into the T-1 bit stream when the incoming bit stream violates the ones density requirements of a T-1 line. Pulse stuffing is used to ensure network synchronization. Inserting the pulse can cause errors in data transmission.

### **QoS - Quality of Service**

The "quality" of the telephone service provided to any given individual or business.

### **Quadrature Amplitude Modulation (QAM)**

A modulation scheme which conveys data by modulating the amplitudes of two carrier waves which are out of phase with each other by 90° (thus called quadrature carriers).

### **Quantizing Noise**

Noise caused by the inability of an analog signal to be exactly replicated in digital form (digital samples are not fine enough in amplitude representation and/or frequency).

**RAS - Remote Access Server**

A computer and associated software that allows users to dial in or gain access to a network remotely.

**RBHC - Regional Bell Holding Company**

One of the seven companies formed by the AT&T divestiture to perform regulated and non regulated telephone services.

**RBOC - Regional Bell Operating Company**

A term describing one of the U.S. Regional telephone companies (or their successors) that were created as a result of the breakup of American Telephone and Telegraph Company (AT&T, known also as the Bell System or "Ma Bell") by a U.S. Federal Court consent decree on December 31, 1983. The seven original regional Bell operating companies (RBOC) were Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Bell, Southwestern Bell, and US WEST. Each of these companies owned at least two Bell operating companies (BOC). The BOCs were given the right to provide local phone service while AT&T was allowed to retain its long distance service. The RBOCs and their constituent BOCs are part of the class of local exchange carriers.

**RBS - Robbed- Bit Signaling**

The process where the least significant bit in the 6th and 12th frame (of a SuperFrame) plus the 18 & 24th frame (of an Extended SuperFrame) is "robbed" for voice signaling bits. These signaling bits indicate on hook and off hook conditions, etc. RBS can be disabled on an individual channel basis so that all bits are available for data.

**REN - Ringer Equivalency Number**

FCC Certification number approving a terminal telephone product for direct sale to an end user as to not harm the network. The total number of RENs on one telephone line must not exceed is 5.

**RF – Radio Frequency**

This refers to that portion of the electromagnetic spectrum in which electromagnetic waves can be generated by alternating current fed to an antenna.

**RIP - Routing Information Protocol**

A widely used protocol for managing router information within a self-contained network such as a LAN or an interconnected group of such LANs.

**RZ - Return to Zero**

A method of transmitting binary information whereby voltage returns to a zero (reference level) after each encoded bit.

**Reconciliation**

The process of technology by which the service provider has the ability to measure and rationalize data from multiple data sources.

**Red Alarm**

In T-1, a red alarm occurs when a condition such as Out Of Frame (OOF) exists for a period of 2.5 seconds, causing a Carrier Group Alarm.

**Redundant Card**

A spare card in a multiplexer used as backup for another card.

**Redundant Power Supply**

A spare power supply used as backup for another power supply.

**Reference Clock**

A clock of high stability and accuracy that is used to govern the frequency of a network and mutually synchronizing clocks of lower stability. (See node reference clock.)

**Ringdown**

The method of signaling an operator in which telephone ringing current is sent over the local loop to operate a lamp and the drop of a self locking relay.

**RJ45**

A modular 8-wire jack/connector used with copper cable having four twisted pairs.

**Route**

A connection path that consists of an originating node, the node through which the route passes (transfer point), and a destination node. Routes can be defined as either primary or alternate routes.

**Router**

Communications equipment which forwards information on a connectionless basis. More specifically; a computer that connects different networks (LANs and WANs) at the Layer 3 of the OSI Reference Model level often using IP addresses.

**Routing**

The process of selecting a communication path through the network.

**RS-232**

An EIA specified physical interface, with associated electrical signaling, between data communications equipment (DCE) and data terminal equipment (DTE).

**RS-422**

An EIA specification defining the electrical characteristics of balanced -voltage digital interface circuits.

**RS-423**

An EIA specification defining the electrical characteristics of unbalanced voltage digital interface circuits.

**RS-449**

An EIA specification defining the signals and pin assignments for a 37-pin and 9-pin physical interface (used between DTE and DCE).

**SDDN - Software Defined Data Network**

An extension to the SDN service which provides high-speed switched data links on demand. SDDN operates at 56, 64, and 384 Kbps. This service is included here since it is accessed at 1.544 Mbps, but is in reality an ISDN service.

**SDH - Synchronous Digital Hierarchy**

The CCITT-defined world standard of synchronization whose base transmission level is 155 Mbps (STM-1) and is equivalent to SONET's STS-3 or OC-3 transmission rate. SDH standards were published in 1989 to address interworking between the European and North American transmission hierarchies.

**SDN - Software Defined Network**

An AT&T service which allows customers to define their own private network using the public T-1 network. Access to the AT&T POP is via a T-1 link, thereafter, the customer can control where subrate DSO and bundles are routed on a more or less fixed basis through the network. These services are described in the AT&T Technical Reference CCR (Customer Controlled Reconfiguration).

**SDSL - Symmetric Digital Subscriber Line**

A DSL based on ISDN with 2B1Q, but is symmetric in nature where both downstream and upstream traffic bandwidth may be up to 2.3 Mbps.

**SHDSL - Symmetric High Bit Rate Digital Subscriber Loop**

SHDSL is defined by the new ITU Global Standard G991.2 from February 2001 and provides high symmetric data rates with guaranteed bandwidth and low interference with other telecommunications services.

**SLA - Service Level Agreement**

A contract set up between an end-user and a service provider outlining the guarantees of what will be provided for that digital service.

**SMDS - Switched Multi-megabit Data Service**

An RBOC proposed very high-speed switched service for linking local area networks.

**SNMP - Simple Network Management Protocol**

Protocol used with TCP/IP based Internets. Defines the protocol for managers (clients) to communicate with agents (servers).

**SONET - Synchronous Optical Network**

A Belcore standard for a family of fiber optic transmission rates from the base rate of 51.84 Mbps to 13.22 Gbps, created to provide the flexibility needed to transport many digital signals that have different capacities, and to provide a standard for manufacturers to design to. SONET is the U.S. (American National Standards Institute) standard for synchronous data transmission on optical media. The international equivalent of SONET is synchronous digital hierarchy (SDH). Together, they ensure standards so that digital networks can interconnect internationally and that existing conventional transmission systems can take advantage of optical media through tributary attachments.

**SPE – Synchronous Payload Envelope**

The major portion of the SONET frame format used to transport payload and STS path overhead.

**SPID - Service Profile Identifier**

A unique identifier that is used to represent the service and feature identifiers of a particular Basic Rate ISDN line or service provider. (This number generally is 10+ digits long and includes the LDN.)

**SRDM (or SDM) - Subrate Data Multiplexing**

A service or equipment that combines multiple data channels operating at 2.4 Kbps to 9.6 Kbps into a 64 Kbps DS0 channel. Intermediate rates of 19.2, 28.8, and 38.4 bps are provided by combining 9.6 Kbps channels.

**SSL - Secure Sockets Layer**

A commonly used protocol for managing the security of message transmission on the Internet. SSL uses a program layer located between the Internet's Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers.

**STM – Synchronous Transfer Module**

A measure of the SDH transmission hierarchy. STM-1 is SDH's base-level transmission rate equal to 155 Mbps. Higher rates of STM-4, STM-6 and STM-64 are also defined.

**STP - Shielded Twisted Pair**

A special kind of copper telephone wiring used in some business installations. An outer covering or shield is added to the ordinary twisted pair telephone wires and functions as a ground.

**STS-1 - Synchronous Transport Signal Level 1**

The basic SONET building block signal transmitted at 51.84 Mbps data rate.

**STS-n - Synchronous Transport Signal Level n**

The signal obtained by multiplexing integer multiples (n) of STS-1 signals together.

**Sample**

The value of a particular characteristic of a signal at a chosen instant.

**Sampling**

The process of taking samples, usually at equal time intervals.

**Sampling Rate**

The number of samples per unit time (e.g., rate of sampling a voice signal).

**SKYNET Ti .5**

The satellite T-1 service provided by AT&T.

**Slip**

The loss of a data bit on a T-1 link due to a frame misalignment between the timing at a transmit node and timing at a receive node.

**Span Line**

A T-1 link, including the wires and repeaters.

**S/T Interface**

A common way of referring to either an S or T Interface. This can be used to connect directly to an ISDN 2B+D NT1 or an NT2 device with a terminal adapter.

**Star Configuration**

Communications network comprised of multiple point-to-point systems all with one common point. At the common point, or hub, the channels from one spoke of the star can be rerouted to

another spoke of the star via digital cross connect equipment. To reduce the vulnerability of the spokes of this star configuration, redundant systems are commonly used.

### **Statefull Inspection**

Statefull Inspection is an advanced packet-filtering technology within firewalls that checks and verifies each network packet in order to detect suspicious activity. Many network security experts recommend the Statefull Inspection as the most trusted firewall technology.

### **Statistical Multiplexer**

A multiplexer that aggregates (allocates bandwidth) to asynchronous and synchronous data based upon the statistical nature of the data traffic.

### **Stratum**

Level of clock source used to categorize accuracy.

### **Subrate**

A generic term that usually refers to digital communications operating at less than 64 Kbps.

### **Superframe**

A frame format that consists of twelve D4 frames.

### **Supervisory Terminal**

A terminal where a user can configure, diagnose, and monitor a node and the network.

### **Synchronization**

The process of ensuring that network elements maintain timing relationships.

#### **Network Timing Synchronization**

A network where all communication T-1 links are synchronized to a common clock between the nodes to assure no slips occur.

#### **Frame Synchronization**

Delimiting frames within the 1.544 Mbps DS1 signals.

### **Synchronous Data**

A transmission method of synchronizing bits to a clock. Bit transfers are controlled by clock signals at the sending and receiving stations. Counting the bits forms characters. Special "sync" characters in the data stream are uniquely recognizable and reset the counter to the beginning of a new character.

### **Synchronous Group**

A group of synchronous ports that are configured with the same parameters.

### **Synchronous Port Clock Source**

The master node reference clock is generated by frequency locking the system clock to a synchronous clock signal received from a channel card. The system clock may be derived from any of the synchronous ports (external clock mode or DDS mode). Allowable clock rates are any valid channel speed. Primary and secondary sources may be defined for redundancy.

**Synchronous Transmission** A method of data transmission which allows characters to be sent in a continuous stream; the beginning of one character contiguous with the end of the preceding

one. Separation of characters requires the receiver to maintain synchronization to a master timing source.

### **TDM - Time Division Multiplexing**

A transmission technique that divides a communications circuit into multiple channels for simultaneous data transmission by assigning different time slots of the entire bandwidth to individual channel inputs (on a byte or bit level).

### **TE1 - Terminal Equipment type 1**

Equipment that can directly connect to the ISDN line (often using an S/ T Interface). Examples are ISDN phones, ISDN routers, ISDN computers etc.

### **TE2 - Terminal Equipment type 2**

Equipment that is non ISDN equipment. Needs an external terminal adapter. Examples are PCs with EIA 232 interfaces and analog telephone sets.

### **Telco - Telephone Company**

The local telephone company.

### **T- Carrier**

A digital transmission facility designed to carry speech and other signals in digital form (e.g., T1).

### **T1**

A digital carrier signal designed to carry speech or data at the DS1 rate, which is 1.544 Mbps. A circuit that is used as a time division link between multiplexers to transmit DS1 formatted digital signals at a rate of 1.544 Mbps (full T1 rate).

### **T3**

A digital carrier signal designed to carry speech or data at the DS3 rate, which is 44.736 Mbps. (See DS3.)

### **Tariff**

The list of rates and conditions for particular services offered or supplied by a telephone company.

### **Teleprotection**

A type of communication terminal equipment used by the relaying industry for sending discrete contact logic signals from point to point with a high degree of security and dependability.

### **Telnet**

TCP/IP application that provides a terminal interface between computers attached to a TCP/IP network. This allows a user at one site to interact with a terminal at another site as if by a local terminal.

### **Timing**

Refers to the source of clock signals used to synchronize the network (e.g., internal timing, external timing). (See clock.)

**Topology**

The configuration of the nodes from the highest order down.

**Trunked Radio**

A system that allows multichannel radios to communicate via a central radio backbone. The radios are assigned to a unique channel at the time a connection is made.

**Tunnel**

An established network connection in which data is encrypted and encapsulated for transmission across a public or untrusted network, for eventual de-encapsulation and decryption.

**U loop (or) U-Interface**

An ISDN 2-wire digital circuit between the customer's network termination and the Local Exchange Carrier's termination in the Central Office.

**UL 1950**

Underwriters Laboratories 1950- The compliance testing that is done to products connected *to* a Local Area Network.

**UNI**

User to Network Interface- Describes the connection between the user and the public network service provider.

**Upstream Link**

The T-1 link where the node reference clock is recovered.

**V.35**

High Speed Digital Interface used for synchronous data rates up to approximately full Mbps speed.

**VAD**

Voice Activation Detection- A software application that allows a data network carrying voice traffic over the Internet to detect the absence of audio and conserve bandwidth by preventing the transmission of "silent packets" over the network. Most conversations include about 50 percent silence. VAD (also called "silence suppression") can be enabled to monitor signals for voice activity so that when silence is detected for a specified amount of time, the application informs the Packet Voice Protocol and prevents the encoder output from being transported across the network.

**VC**



Virtual Circuit- A circuit or path between points in a network that appears to be a discrete, physical path but is actually a managed pool of circuit resources from which specific circuits are allocated as needed to meet traffic requirements.

### **VoATM**

Voice over ATM- A generic term for describing the delivery of voice services using Asynchronous Transfer Mode.

### **VoDSL**

Voice over Digital Subscriber Line- A term used to describe the delivery of voice services using Asynchronous Transfer Mode and DSL. The typical voice over DSL model includes an IAD for delivering voice and data services to the end customer, a DSLAM for aggregating multiple DSL lines into a single ATM cell stream and a voice gateway for interfacing back into the existing public switched telephone network.

### **VoIP**

Voice over IP- A term used in IP telephony for a set of facilities for managing the delivery of voice information using the Internet Protocol (IP). In general, this means sending voice information in digital form in discrete packet rather than in the traditional circuit -committed protocols of the public switched telephone. A major advantage of VoIP and Internet telephony is that it avoids the tolls charged by ordinary telephone service.

### **VPN**

Virtual Private Network- A private data network that makes use of the public telecommunication infrastructure, maintaining privacy through the use of tunneling protocol and security procedures. A virtual private network can be contrasted with a system of owned or leased lines that can only be used by one company.

### **VT – Virtual Tributary**

A signal designed for transport and switching of sub-STS-1 payloads.

### **VT100**

Video Terminal 100- Terminal emulation that is performed locally at the host unit and is usually set up through HyperTerminal. (ADTRAN equipment that has a Chain-In port can connect directly to a PC for this terminal emulation-configuration and diagnostics can be run from a terminal session).

### **Video Codec**

A device that converts an analog signal into digital for transport and converts a digital signal into analog for display.

### **Virtual circuit**

A network connection, generally implemented by packet switching, that gives the appearance to the communicating endpoints of having been established by circuit switching, and for which reliability of communication is the responsibility of the network. Communication protocols that implement virtual circuits are also called "connection-oriented

### **Virtual Connection**

A temporary connection established on either time-of-day, EIA, or E&M signal conditions.

**VT Group**

A 9-row x 12-column structure (108 bytes) that carries one or more VTs of the same size. Seven VT groups can be fitted into one STS-1 payload.

**WAN**

Wide Area Network- A high-speed network within a wide geographical area (usually larger than a city or a metropolitan area) that shares data, programs, or equipment.

**WAP**

Wireless Application Protocol-A specification for a set of communication protocols to standardize the way that wireless devices, such as cellular telephones and radio transceivers, can be used for Internet access, including email, the World Wide Web, newsgroups and Internet Relay Chat.

**WDM**

Wavelength Division Multiplexing- A technology that puts data from different sources together on an optical fiber, with each signal carried on its own separate light wave. Using WDM, up to 80 (and theoretically more) separate wavelengths or channel of data can be multiplexing into a lightstream transmitted on a single optical fiber. In a system with each channel carrying 2.5 Gbps (One thousand million bits per second). Up to 200 billion bits can be delivered a second by the optical fiber.

**Wander**

Long-term variations in a waveform.

**X509**

The most widely used standard for defining digital certificates.

**Yellow Alarm**

An alarm signal sent back towards the source of a failed signal due to the presence of an Alarm Indication Signal (AIS) or Out Of Service Signal (OOS).

**Zero Bit Insertion**

A process in bit-oriented protocols where a zero is inserted into a string of ones by the sender to prevent the receiver from interpreting valid user data (the string of ones) as control character (a Flag character for instance). This is not the same as pulse stuffing used in T-1 networks.

**Zero Suppression**

The insertion of a logical one to prevent the transmission of eight consecutive zero bits. Primarily used to ensure sufficient ones density.