azimuth. The angle that measures deviation with respect to the south in the northern hemisphere, and with respect to the north in the southern hemisphere. See also: *inclination*

B

bandwidth. A measure of frequency ranges, typically used for digital communications. The word bandwidth is also commonly used interchangeably with *capacity* to refer to the theoretical maximum data rate of a digital communications line. See also: *capacity, channel, throughput*

battery. A device used to store energy in a photovoltaic system. See also: *solar panel, regulator, load, converter, inverter*

beamwidth. The angular distance between the points on either side of the main lobe of an antenna, where the received power is half that of the main lobe. The beamwidth of an antenna is usually stated for both the horizontal and vertical planes.

benchmarking. Testing the maximum performance of a service or device. Benchmarking a network connection typically involves flooding the link with traffic and measuring the actual observed throughput, both on transmit and receive.

BGAN see *Broadband Global Access Network*

BNC connector. A coaxial cable connector that uses a "quick-connect" style bayonet lug. BNC connectors are typically found on 10base2 coaxial Ethernet.

bridge. A network device that connects two networks together at the *data link layer*. Bridges do not route packets at the *network layer*. They simply repeat packets between two *link-local* networks. See also: *router* and *transparent bridging firewall*.

bridge-utils. A Linux software package that is required for creating 802.1d Ethernet bridges. *http://bridge.sourceforge.net/*

Broadband Global Access Network (BGAN). One of several standards used for satellite Internet access. See also: *Digital Video Broadcast (DVB-S)* and *Very Small Aperture Terminal (VSAT)*.

broadcast address. On IP networks, the broadcast IP address is used to send data to all hosts in the local subnet. On Ethernet networks, the broadcast MAC address is used to send data to all machines in the same collision domain.

bypass diodes. A feature found on some solar panels that prevents the formation of *hot-spots* on shaded cells, but reduces the maximum voltage of the panel.

C

CA see *Certificate Authority*

Cacti (*http://www.cacti.net/*). A popular web-based monitoring tool written in PHP.

capacity. The theoretical maximum amount of traffic provided by a digital communications line. Often used interchangeably with *bandwidth*.

captive portal. A mechanism used to transparently redirect web browsers to a new location. Captive portals are often used for authentication or for interrupting a user's online session (for example, to display an Acceptable Use Policy).

cell. Solar panels are made up of several individual cells, which are electrically connected to provide a particular value of current and voltage. Batteries are also made up of individual cells connected in series, each of which contributes about 2 volts to the battery.

Certificate Authority. A trusted entity that issues signed cryptographic keys. See also: *Public Key Infrastructure, SSL*

channel capacity. The maximum amount of information that can be sent using a given bandwidth. See also: *bandwidth, throughput, data rate*

channel. A well defined range of frequencies used for communications. 802.11 channels use 22 MHz of bandwidth, but are only separated by 5 MHz. See also: *Appendix B.*

CIDR see *Classless Inter-Domain Routing*

CIDR notation. A method used to define a network mask by specifying the number of bits present. For example, the netmask 255.255.255.0 can be specified as /24 in CIDR notation.

circular polarization. An electromagnetic field where the electric field vector appears to be rotating with circular motion about the direction of propagation, making one full turn for each RF cycle. See also: *horizontal polarization, vertical polarization*

Class A, B, and C networks. For some time, IP address space was allocated in blocks of three different sizes. These were Class A (about 16 million addresses), Class B (about 65 thousand addresses), and Class C (255 addresses). While CIDR has replaced class-based allocation, these classes are often still referred to and used internally in organizations using private address space. See also: *CIDR notation*.

Classless Inter-Domain Routing. CIDR was developed to improve routing efficiency on the Internet backbone by enabling route aggregation and network masks of arbitrary size. CIDR replaces the old class-based addressing scheme. See also: *Class A, B, and C networks*.

client. An 802.11 radio card in *managed mode*. Wireless clients will join a network created by an access point, and automatically change the channel to match it. See also: *access point, mesh*

closed network. An access point that does not broadcast its SSID, often used as a security measure.

coax. A round (coaxial) cable with a center wire surrounded by a dielectric, outer conductor, and tough insulating jacket. Antenna cables are usually made of coax. Coax is short for "of common axis".

collision. On an Ethernet network, a collision occurs when two devices connected to the same physical segment attempt to transmit at the same time. When collisions are detected, devices delay retransmission for a brief, randomly selected period.

conductor. A material that easily allows electric or thermal energy to flow through without much resistance. See also: **dielectric, insulator**

connectionless protocol. A network protocol (such as UDP) that requires no session initiation or maintenance. Connectionless protocols typically require less overhead than session oriented protocols, but do not usually offer data protection or packet reassembly. See also: **session oriented protocol**.

consistent platform. Maintenance costs can be reduced by using a consistent platform, with the same hardware, software, and firmware for many components in a network.

constructive interference. When two identical waves merge and are in phase, the amplitude of the resulting wave is twice that of either of the components. This is called constructive interference. See also: **destructive interference**

controls. In **NEC2**, controls define the RF source in an antenna model. See also: **structure**

converter. A device used to convert DC signals into a different DC or AC voltage. See also: **inverter**

CPE see **Customer Premises Equipment**

cron. A Unix facility that allows timed and repeated execution of programs. See also: **at**

Customer Premises Equipment. Network equipment (such as a **router** or **bridge**) that is installed at a customer's location.

D

data link layer. The second layer in both the OSI and TCP/IP network models. Communications at this layer happen directly between nodes. On Ethernet networks, this is also sometimes called the MAC layer.

data rate. The speed at which 802.11 radios exchange symbols, which is always higher than the available throughput. For example, the nominal data rate of 802.11g is 54 Mbps, while the maximum throughput is about 20 Mbps). See also: **throughput**

dB see **decibel**

DC see **Direct Current**

DC/AC Converter. A device that converts DC power into AC power,

suitable for use with many appliances. Also known as an *inverter*.

DC/DC Converter. A device that changes the voltage of a DC power source. See also: *linear conversion, switching conversion*

decibel (dB). A logarithmic unit of measurement that expresses the magnitude of power relative to a reference level. Commonly used units are dBi (decibels relative to an isotropic radiator) and dBm (decibels relative to a milliwatt).

default gateway. When a router receives a packet destined for a network for which it has no explicit route, the packet is forwarded to the default gateway. The default gateway then repeats the process, possibly sending the packet to its own default gateway, until the packet reaches its ultimate destination.

default route. A network route that points to the default gateway.

Denial of Service (DoS). An attack on network resources, usually achieved by flooding a network with traffic or exploiting a bug in an application or network protocol.

depreciation. An accounting method used to save money to cover the eventual break down of equipment.

destructive interference. When two identical waves merge and are exactly out of phase, the amplitude of the resulting wave is zero. This is called destructive interference. See also: *constructive interference*

DHCP see *Dynamic Host Configuration Protocol*

dielectric. A non-conductive material that separates conducting wires inside a cable.

Digital Elevation Map (DEM). Data that represents the height of terrain for a given geographic area. These maps are used by programs such as *Radio Mobile* to model electromagnetic propagation.

Digital Video Broadcast (DVB-S). One of several standards used for satellite Internet access. See also: *Broadband Global Access Network (BGAN)* and *Very Small Aperture Terminal (VSAT)*.

dipole antenna. The simplest form of *omnidirectional antenna*.

Direct Current (DC). An electrical current which remains constant over time. DC current is typically used for network equipment, such as access points and routers. See also: *Alternating Current*

Direct Sequence Spread Spectrum (DSSS). The radio modulation scheme used by 802.11b.

directional antenna. An antenna that radiates very strongly in a particular direction. Examples of directional antennas include the yagi, dish, and waveguide antennas. See also: *omnidirectional antenna, sectorial antenna*

directivity. The ability of an antenna to focus energy in a particular direction when transmitting, or to receive

energy from a particular direction when receiving.

diversity see *antenna diversity*

DNS see *Domain Name Service*

DNS caching. By installing a DNS server on your local LAN, DNS requests for an entire network may be cached locally, improving response times. This technique is called DNS caching.

dnsmasq. An open source caching DNS and DHCP server, available from *http://thekelleys.org.uk/*

Domain Name Service (DNS). The widely used network protocol that maps IP addresses to names.

dominant mode. The lowest frequency that can be transmitted by a waveguide of a given size.

DoS see *Denial of Service*

DSSS see *Direct Sequence Spread Spectrum*

DVB-S see *Digital Video Broadcast.*

Dynamic Host Configuration Protocol (DHCP). A protocol used by hosts to automatically determine their IP address.

E

eavesdropper. Someone who intercepts network data such as passwords, email, voice data, or online chat.

edge. The place where one organization's network meets another. Edges are defined by the location of the external *router*, which often acts as a *firewall*.

electromagnetic spectrum. The very wide range of possible frequencies of electromagnetic energy. Parts of the electromagnetic spectrum include radio, microwave, visible light, and X rays.

electromagnetic wave. A wave that propagates through space without the need for a propagating medium. It contains an electric and a magnetic component. See also: *mechanical wave*

elevation see *inclination*

end span injectors. An 802.3af *Power over Ethernet* device that provides power via the Ethernet cable. An Ethernet switch that provides power on each port is an example of an end span injector. See also: *mid span injectors*

end-to-end encryption. An encrypted connection negotiated by both ends of a communications session. End-to-end encryption can provide stronger protection than *link layer encryption* when used on untrusted networks (such as the Internet).

EtherApe. An open source network visualization tool. Available at *http://etherape.sourceforge.net/*

Ethereal see *Wireshark*.

Extended Service Set Identifier (ESSID). The name used to identify an 802.11 network. See also: ***closed network***

external traffic. Network traffic that originates from, or is destined for, an IP address outside your internal network, such as Internet traffic.

F

firestarter. A graphical front-end for configuring Linux firewalls available from *http://www.fs-security.com/*.

filter. The default table used in the Linux netfilter firewall system is the filter table. This table is used for determining traffic that should be accepted or denied.

firewall. A router that accepts or denies traffic based on some criteria. Firewalls are one basic tool used to protect entire networks from undesirable traffic.

flush. To remove all entries in a routing table or netfilter chain.

forwarding. When routers receive packets that are destined for a different host or network, they send the packet to the next router closest to its ultimate destination. This process is called forwarding.

forwarding loops. A routing misconfiguration where packets are forwarded cyclically between two or more routers. Catastrophic network failure is prevented by using the TTL value on every packet, but forward-ing loops need to be resolved for proper network operations.

free space loss. Power diminished by geometric spreading of the wavefront, as the wave propagates through space. See also: ***attenuation, free space loss, Appendix C***

frequency. The number of whole waves that pass a fixed point in a period of time. See also: ***wavelength, Hertz***

front-to-back ratio. The ratio of the maximum ***directivity*** of an antenna to its directivity in the opposite direction.

full duplex. Communications equipment that can send and receive at the same time (such as a telephone). See also: ***half duplex***

fwbuilder. A graphical tool that lets you create ***iptables*** scripts on a machine separate from your server, and then transfer them to the server later. *http://www.fwbuilder.org/*

G

gain. The ability of a radio component (such as an antenna or amplifier) to increase the power of a signal. See also: ***decibel***

gain transfer. Comparing an antenna under test against a known standard antenna, which has a calibrated gain.

gasification. The production bubbles of oxygen and hydrogen that

occurs when a battery is ***overcharged***.

globally routable. An address issued by an ISP or RIR that is reachable from any point on the Internet. In IPv4, there are approximately four billion possible IP addresses, although not all of these are globally routable.

H

half duplex. Communications equipment that can send or receive, but never both at once (such as a handheld radio). See also: ***full duplex***.

Heliax. High quality coaxial cable that has a solid or tubular center conductor with a corrugated solid outer conductor which enables it to flex. See also: ***coax***

Hertz (Hz). A measure of ***frequency***, denoting some number of cycles per second.

HF (***High-Frequency***).   Radio waves from 3 to 30 MHz are referred to as HF. Data networks can be built on HF that operate at very long range, but with very low data capacity.

hop. Data that crosses one network connection.   A web server may be several hops away from your local computer, as packets are forwarded from router to router, eventually reaching their ultimate destination.

horizontal polarization. An electromagnetic field with the electric component moving in a linear horizontal direction. See also: ***circular polarization, vertical polarization***

hot-spot. In wireless networks, a hot-spot is a location that provides Internet access via ***Wi-Fi***, typically by use of a ***captive portal***. In ***photovoltaic systems***, a hot-spot occurs when a single ***cell*** in a ***solar panel*** is shaded, causing it to act as a resistive load rather than to generate power.

hub. An Ethernet networking device that repeats received data on all connected ports. See also: ***switch***.

Huygens principle. A wave model that proposes an infinite number of potential wavefronts along every point of an advancing wavefront.

Hz see ***Hertz***

I

IANA see ***Internet Assigned Numbers Authority***

ICMP see ***Internet Control Message Protocol***

ICP see ***Inter-Cache Protocol***

impedance. The quotient of voltage over current of a transmission line, consisting of a resistance and a reactance. The load impedance must match the source impedance for maximum power transfer (50Ω for most communications equipment).

inbound traffic. Network packets that originate from outside the local network (typically the Internet) and

are bound for a destination inside the local network. See also: ***outbound traffic***.

inclination. The angle that marks deviation from a horizontal plane. See also: ***azimuth***

infrastructure mode see ***master mode***

insulator see ***dielectric***

Inter-Cache Protocol (ICP). A high performance protocol used to communicate between web caches.

Internet Assigned Numbers Authority (IANA). The organization that administers various critical parts of Internet infrastructure, including IP address allocation, DNS root name servers, and protocol service numbers.

Internet Control Message Protocol (ICMP). A Network Layer protocol used to inform nodes about the state of the network. ICMP is part of the Internet protocol suite. See also: ***Internet protocol suite***.

Internet layer see ***network layer***

Internet Protocol (IP). The most common network layer protocol in use. IP defines the hosts and networks that make up the global Internet.

Internet protocol suite (TCP/IP). The family of communication protocols that make up the Internet. Some of these protocols include TCP, IP, ICMP, and UDP. Also called the ***TCP/IP protocol suite***, or simply ***TCP/IP***.

Intrusion Detection System (IDS). A program that watches network traffic, looking for suspicious data or behavior patterns. An IDS may make a log entry, notify a network administrator, or take direct action in response to undesirable traffic.

inverter see ***DC/AC Converter***

IP see ***Internet Protocol***

iproute2. The advanced routing tools package for Linux, used for traffic shaping and other advanced techniques. Available from *http://linux-net.osdl.org/*

iptables. The primary command used to manipulate netfilter firewall rules.

irradiance. The total amount of solar energy that lights a given area, in W/m^2

ISM band. ISM is short for Industrial, Scientific, and Medical. The ISM band is a set of radio frequencies set aside by the ITU for unlicensed use.

isotropic antenna. A hypothetical antenna that evenly distributes power in all directions, approximated by a dipole.

IV characteristic curve. A graph that represents the current that is provided based on the voltage generated for a certain solar radiation.

K

knetfilter. A graphical front-end for configuring Linux firewalls. Available from *http://venom.oltrelinux.com/*

known good. In troubleshooting, a known good is any component that can be substituted to verify that its counterpart is in good, working condition.

L

lag. Common term used to describe a network with high **latency**.

lambda (λ) see **wavelength**

LAN see **Local Area Network**

latency. The amount of time it takes for a packet to cross a network connection. It is often (incorrectly) used interchangeably with Round Trip Time (RTT), since measuring the RTT of a wide-area connection is trivial compared to measuring the actual latency. See also: **Round Trip Time**.

lead-acid batteries. Batteries consisting of two submerged lead electrodes in an electrolytic solution of water and sulfuric acid. See also: **stationary batteries**

lease time. In DHCP, IP addresses are assigned for a limited period of time, known as the lease time. After this time period expires, clients must request a new IP address from the DHCP server.

Line of Sight (LOS). If a person standing at point A has an unobstructed view of point B, then point A is said to have a clear Line of Sight to point B.

linear polar coordinates. A graph system with equally spaced, graduated concentric circles representing an absolute value on a polar projection. Such graphs are typically used to represent antenna radiation patterns. See also: **logarithmic polar coordinates**

linear conversion. A DC voltage conversion method that lowers the voltage by converting excess energy to heat. See also: **switching conversion**

linear polarization. An **electromagnetic wave** where the electric field vector stays in the same plane all the time. The electric field may leave the antenna in a vertical orientation, a horizontal orientation, or at some angle between the two. See also: **vertical polarization, horizontal polarization**

link budget. The amount of radio energy available to overcome path losses. If the available link budget exceeds the path loss, minimum receive sensitivity of the receiving radio, and any obstacles, then communications should be possible.

link layer encryption. An encrypted connection between **link-local** devices, typically a wireless **client** and an **access point**. See also: **end-to-end encryption**

link-local. Network devices that are connected to the same physical segment communicate with each other directly are said to be link-local. A link-local connection cannot cross a router boundary without using some kind of encapsulation, such as a ***tunnel*** or a ***VPN***.

listen. Programs that accept connections on a TCP port are said to listen on that port.

load. Equipment in a photovoltaic system that consumes energy. See also: ***battery, solar panel, regulator, converter, inverter***

Local Area Network (LAN). A network (typically Ethernet) used within an organization. The part of a network that exists just behind an ISP's router is generally considered to be part of the LAN. See also: ***WAN***.

logarithmic polar coordinates. A graph system with logarithmically spaced, graduated concentric circles representing an absolute value on a polar projection. Such graphs are typically used to represent antenna radiation patterns. See also: ***linear polar coordinates***

long fat pipe network. A network connection (such as VSAT) that has high capacity and high latency. In order to achieve the best possible performance, TCP/IP must be tuned to match the traffic on such links.

LOS see ***Line of Sight***

M

MAC layer see ***data link layer***

MAC address. A unique 48 bit number assigned to every networking device when it is manufactured. The MAC address is used for link-local communications.

MAC filtering. An access control method based on the MAC address of communicating devices.

MAC table. A network switch must keep track of the MAC addresses used on each physical port, in order to efficiently distribute packets. This information is kept in a table called the MAC table.

maintenance-free lead-acid batteries see ***lead-acid batteries***

Man-In-The-Middle (MITM). A network attack where a malicious user intercepts all communications between a client and a server, allowing information to be copied or manipulated.

managed hardware. Networking hardware that provides an administrative interface, port counters, SNMP, or other interactive features is said to be managed.

managed mode. A radio mode used by 802.11 devices that allows the radio to join a network created by an access point. See also: ***master mode, ad-hoc mode, monitor mode***

master browser. On Windows networks, the master browser is the computer that keeps a list of all the computers, shares and printers that are available in **Network Neighborhood** or **My Network Places**.

master mode. A radio mode used by 802.11 devices that allows the radio to create networks just as an access point does. See also: ***managed mode, ad-hoc mode, monitor mode***

match condition. In netfilter, a match condition specifies the criteria that determine the ultimate target for a given packet. Packets may be matched on MAC address, source or destination IP address, port number, data contents, or just about any other property.

Maximum Depth of Discharge (DoD$_{max}$). The amount of energy extracted from a battery in a single discharge cycle, expressed as a percentage.

Maximum Power Point (P$_{max}$). The point where the power supplied by a solar panel is at maximum.

MC-Card. A very small microwave connector found on Lucent / Orinoco / Avaya equipment.

mechanical wave. A wave caused when some medium or object is swinging in a periodic manner. See also: ***electromagnetic wave***

Media Access Control layer see ***data link layer***

mesh. A network with no hierarchical organization, where every node on the network carries the traffic of every other as needed. Good mesh network implementations are self-healing, which means that they automatically detect routing problems and fix them as needed.

message types. Rather that port numbers, ICMP traffic uses message types to define the type of information being sent. See also: ***ICMP***.

method of the worst month. A method for calculating the dimensions of a standalone photovoltaic system so it will work in the month in which the demand for energy is greatest with respect to the available solar energy. It is the worst month of the year, as this month with have the largest ratio of demanded energy to available energy.

MHF see ***U.FL***

microfinance. The provision of small loans, savings and other basic financial services to the world's poorest people.

mid span injectors. A **Power over Ethernet** device inserted between an Ethernet switch and the device to be powered. See also: ***end span injectors***

milliwatts (mW). A unit of power representing one thousandth of a Watt.

MITM see ***Man-In-The-Middle***

MMCX. A very small microwave connector commonly found on equipment manufactured by Senao and Cisco.

monitor mode. A radio mode used by 802.11 devices not normally used for communications that allows the radio passively monitor radio traffic. See also: **master mode, managed mode, ad-hoc mode**

monitor port. On a managed switch, one or more monitor ports may be defined that receive traffic sent to all of the other ports. This allows you to connect a traffic monitor server to the port to observe and analyze traffic patterns.

Multi Router Traffic Grapher (MRTG). An open source tool used for graphing traffic statistics. Available from *http://oss.oetiker.ch/mrtg/*

multipath. The phenomenon of reflections of a signal reaching their target along different paths, and therefore at different times.

multipoint-to-multipoint see **mesh**

mW see **milliwatt**

My TraceRoute (mtr). A network diagnostic tool used as an alternative to the traditional traceroute program. *http://www.bitwizard.nl/mtr/*. See also: **traceroute** / **tracert**.

N

N connector. A sturdy microwave connector commonly found on out-door networking components, such as antennas and outdoor access points.

Nagios (*http://nagios.org/*)   A real-time monitoring tool that logs and notifies a system administrator about service and network outages.

NAT see **Network Address Translation**

nat. The table used in the Linux netfilter firewall system to configure Network Address Translation.

NEC2 see **Numerical Electromagnetics Code**

NetBIOS. A session layer protocol used by Windows networking for file and printer sharing. See also: **SMB**.

netfilter. The packet filtering framework in modern Linux kernels is known as netfilter. It uses the iptables command to manipulate filter rules. *http://netfilter.org/*

netmask (**network mask**). A netmask is a 32-bit number that divides the 16 million available IP addresses into smaller chunks, called subnets. All IP networks use IP addresses in combination with netmasks to logically group hosts and networks.

NeTraMet. An open source network flow analysis tool available from *freshmeat.net/projects/netramet/*

network address. The lowest IP number in a subnet. The network address is used in routing tables to specify the destination to be used

when sending packets to a logical group of IP addresses.

Network Address Translation (NAT). NAT is a networking technology that allows many computers to share a single, globally routable IP address. While NAT can help to solve the problem of limited IP address space, it creates a technical challenge for two-way services, such as Voice over IP.

network detection. Network diagnostic tools that display information about wireless networks, such as the network name, channel, and encryption method used.

network layer. Also called the Internet layer. This is the third layer of the OSI and TCP/IP network models, where IP operates and Internet routing takes place.

network mask see ***netmask***

ngrep. An open source network security utility used to find patterns in data flows. Available for free from *http://ngrep.sourceforge.net/*

node. Any device capable of sending and receiving data on a network. Access points, routers, computers, and laptops are all examples of nodes.

Nominal Capacity (C_N). The maximum amount of energy that can be extracted from a fully charged battery. It is expressed in Ampere-hours (Ah) or Watt-hours (Wh).

Nominal Voltage (V_N). The operating voltage of a photovoltaic system, typically 12 or 24 volts.

ntop. A network monitoring tool that provides extensive detail about connections and protocol use on a local area network. *http://www.ntop.org/*

null. In an antenna radiation pattern, a null is a zone in which the effective radiated power is at a minimum.

nulling. A specific case of ***multipath*** interference where the signal at the receiving antenna is zeroed by the ***destructive interference*** of reflected signals.

number of days of autonomy (N). The maximum number of days that a photovoltaic system can operate without significant energy received from the sun.

Numerical Electromagnetics Code (NEC2). A free antenna modeling package that lets you build an antenna model in 3D, and then analyze the antenna's electromagnetic response. *http://www.nec2.org/*

O

OFDM see ***Orthogonal Frequency Division Multiplexing***

omnidirectional antenna. An antenna that radiates almost equally in every direction in the horizontal plane. See also: ***directional antenna, sectorial antenna***

one-arm repeater. A wireless repeater that only uses a single radio, at significantly reduced throughput. See also: **repeater**

onion routing. A privacy tool (such as **Tor**) that repeatedly bounces your TCP connections across a number of servers spread throughout the Internet, wrapping routing information in a number of encrypted layers.

OR logic. A logical operation that evaluates as true if any of the items being compared also evaluate as true. See also: **AND logic**.

Orthogonal Frequency Division Multiplexing (OFDM)

OSI network model. A popular model of network communications defined by the ISO/IEC 7498-1 standard. The OSI model consists of seven interdependent layers, from the physical through the application. See also: **TCP/IP network model**.

outbound traffic. Network packets that originate from the local network and are bound for a destination outside the local network (typically somewhere on the Internet). See also: **inbound traffic**.

overcharge. The state of a battery when charge is applied beyond the limit of the battery's capacity. If energy is applied to a battery beyond its point of maximum charge, the electrolyte begins to break down. **Regulators** will allow a small amount of overcharge time to a battery to avoid **gasification**, but will remove power before the battery is damaged.

overdischarge. Discharging a battery beyond its **Maximum Depth of Discharge**, which results in deterioration of the battery.

oversubscribe. To allow more users than the maximum available bandwidth can support.

P

packet. On IP networks, messages sent between computers are broken into small pieces called packets. Each packet includes a source, destination, and other routing information that is used to route it to its ultimate destination. Packets are reassembled again at the remote end by TCP (or another protocol) before being passed to the application.

packet filter. A firewall that operates at the Internet layer by inspecting source and destination IP addresses, port numbers, and protocols. Packets are either permitted or discarded depending on the packet filter rules.

partition. A technique used by network hubs to limit the impact of computers that transmit excessively. Hubs will temporarily remove the abusive computer (partition it) from the rest of the network, and reconnect it again after some time. Excessive partitioning indicates the presence of an excessive bandwidth consumer, such as a peer-to-peer client or network virus.

passive POE injector see **Power over Ethernet**

path loss. Loss of radio signal due to the distance between communicating stations.

Peak Sun Hours (PSH). Average value of daily irradiation for a given area.

photovoltaic generator see **solar panel**

photovoltaic solar energy. The use of solar panels to collect solar energy to produce electricity. See also: **thermal solar energy**

photovoltaic system. An energy system that generates electrical energy from solar radiation and stores it for later use. A standalone photovoltaic system does this without any connection to an established power grid. See also: **battery, solar panel, regulator, load, converter, inverter**

physical layer. The lowest layer in both the OSI and TCP/IP network models. The physical layer is the actual medium used for communications, such as copper cable, optic fiber, or radio waves.

pigtail. A short microwave cable that converts a non-standard connector into something more robust and commonly available.

ping. A ubiquitous network diagnostic utility that uses ICMP echo request and reply messages to determine the round trip time to a network host. Ping can be used to determine the location of network problems by "pinging" computers in the path between the local machine and the ultimate destination.

PKI see **Public Key Infrastructure**

plomb. A heavy piece of metal buried in the earth to improve a ground connection.

PoE see **Power over Ethernet**

point-to-multipoint. A wireless network where several nodes connect back to a central location. The classic example of a point-to-multipoint network is an access point at an office with several laptops using it for Internet access. See also: **point-to-point, multipoint-to-multipoint**

point-to-point. A wireless network consisting of only two stations, usually separated by a great distance. See also: **point-to-multipoint, multipoint-to-multipoint**

Point-to-Point Protocol (PPP). A network protocol typically used on serial lines (such as a dial-up connection) to provide IP connectivity.

polar plot. A graph where points are located by projection along a rotating axis (radius) to an intersection with one of several concentric circles. See also: **rectangular plot**

polarization. The direction of the electric component of an electromagnetic wave as it leaves the transmitting antenna. See also: **horizontal polarization, vertical polarization, circular polarization**

polarization mismatch. A state where a transmitting and receiving antenna do not use the same polarization, resulting in signal loss.

policy. In netfilter, the policy is the default action to be taken when no other filtering rules apply. For example, the default policy for any chain may be set to ACCEPT or DROP.

port counters. Managed switches and routers provide statistics for each network port called port counters. These statistics may include inbound and outbound packet and byte counts, as well as errors and retransmissions.

power. The amount of energy in a certain amount of time.

Power over Ethernet (PoE). A technique used to supply DC power to devices using the Ethernet data cable. See also: *end span injectors, mid span injectors*

PPP see *Point to Point Protocol*

presentation layer. The sixth layer of the OSI networking model. This layer deals with data representation, such as MIME encoding or data compression.

private address space. A set of reserved IP addresses outlined in RFC1918. Private address space is frequently used within an organization, in conjunction with Network Address Translation (NAT). The reserved private address space ranges include 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16. See also: *NAT*.

Privoxy (*http://www.privoxy.org/*). A web proxy that provides anonymity through the use of filters. Privoxy is often used in conjunction with *Tor*.

proactive routing. A *mesh* implementation where every node knows about the existence of every other node in the mesh cloud as well as which nodes may be used to route traffic to them. Each node maintains a routing table covering the whole mesh cloud. See also: *reactive routing*

protocol analyzer. A diagnostic program used to observe and disassemble network packets. Protocol analyzers provide the greatest possible detail about individual packets.

protocol stack. A set of network protocols that provide interdependent layers of functionality. See also: *OSI network model* and *TCP/IP network model*.

PSH see *Peak Sun Hours*

Public key cryptography. A form of encryption used by SSL, SSH, and other popular security programs. Public key cryptography allows encrypted information to be exchanged over an untrusted network without the need to distribute a secret key.

Public Key Infrastructure (PKI). A security mechanism used in conjunction with *public key cryptography* to prevent the possibility of *Man-In-The-Middle* attacks. See also: *certificate authority*

Q

quick blow. A type of fuse that immediately blows if the current flowing through it is higher than their rating. See also: **slow blow**

R

radiation pattern see **antenna pattern.**

radio. The portion of the electromagnetic spectrum in which waves can be generated by applying alternating current to an antenna.

reactive routing. A **mesh** implementation where routes are computed only when it is necessary to send data to a specific node. See also: **proactive routing**

realtime monitoring. A network monitoring tool that performs unattended monitoring over long periods, and notifies administrators immediately when problems arise.

reciprocity. An antenna's ability to maintain the same characteristics regardless if whether it is transmitting or receiving.

recombinant batteries see **lead-acid batteries**

rectangular plot. A graph where points are located on a simple grid. See also: **polar plot**

Regional Internet Registrars (RIR). The 4 billion available IP addresses are administered by the IANA. The space has been divided into large subnets, which are delegated to one of the five regional Internet registries, each with authority over a large geographic area.

regulator. The component of a **photovoltaic system** that assures that the **battery** is working in appropriate conditions. It avoids **overcharging** or **undercharging** the battery, both of which are very detrimental to the life of the battery. See also: **solar panel, battery, load, converter, inverter**

repeater. A node that is configured to rebroadcast traffic that is not destined for the node itself, often used to extend the useful range of a network.

Request for Comments (RFC). RFCs are a numbered series of documents published by the Internet Society that document ideas and concepts related to Internet technologies. Not all RFCs are actual standards, but many are either approved explicitly by the IETF, or eventually become de facto standards. RFCs can be viewed online at *http://rfc.net/.*

return loss. A logarithmic ratio measured in dB that compares the power reflected by the antenna to the power that is fed into the antenna from the transmission line. See also: **impedance**

reverse polarity (RP). Proprietary microwave connectors, based on a standard connector but with the genders reversed. The **RP-TNC** is

probably the most common reverse polarity connector, but others (such as RP-SMA and RP-N) are also commonplace.

RF transmission line. The connection (typically *coax*, *Heliax*, or a *waveguide*) between a radio and an antenna.

RIR see *Regional Internet Registrars*

Round Trip Time (RTT). The amount of time it takes for a packet to be acknowledged from the remote end of a connection.   Frequently confused with *latency*.

rogue access points. An unauthorized access point incorrectly installed by legitimate users, or by a malicious person who intends to collect data or do harm to the network.

Round Robin Database (RRD). A database that stores information in a very compact way that does not expand over time.   This is the data format used by RRDtool and other network monitoring tools.

router.   A device that forwards packets between different networks. The process of forwarding packets to the next hop is called *routing.*

routing. The process of forwarding packets between different networks. A device that does this is called a *router*.

routing table.   A list of networks and IP addresses kept by a router to determine how packets should be forwarded.   If a router receives a packet for a network that is not in the routing table, the router uses its default gateway. Routers operate at the Network Layer.   See also: *bridge* and *default gateway*.

RP see *Reverse Polarity*

RP-TNC. A common proprietary version of the TNC microwave connector, with the genders reversed. The RP-TNC is often found on equipment manufactured by Linksys.

RRD see *Round Robin Database*

RRDtool. A suite of tools that allow you to create and modify RRD databases, as well as generate useful graphs to present the data. RRDtool is used to keep track of time-series data (such as network bandwidth, machine room temperature, or server load average) and can display that data as an average over time. RRDtool is available from *http://oss.oetiker.ch/rrdtool/*

rsync (*http://rsync.samba.org/*). An open source incremental file transfer utility used for maintaining mirrors.

RTT see *Round Trip Time*

S

SACK see *Selective Acknowledgment*

scattering. Signal loss due to objects in the path between two nodes. See also: *free space loss, attenuation*

sectorial antenna. An antenna that radiates primarily in a specific area. The beam can be as wide as 180 degrees, or as narrow as 60 degrees. See also: **directional antenna, omnidirectional antenna**

Secure Sockets Layer (SSL). An end-to-end encryption technology built into virtually all web browsers. SSL uses **public key cryptography** and a trusted **public key infrastructure** to secure data communications on the web. Whenever you visit a web URL that starts with https, you are using SSL.

Selective Acknowledgment (SACK). A mechanism used to overcome TCP inefficiencies on high latency networks, such as VSAT.

Server Message Block (SMB). A network protocol used in Windows networks to provide file sharing services. See also: **NetBIOS**.

Service Set ID (SSID) see **Extended Service Set Identifier**

session layer. Layer five of the OSI model, the Session Layer manages logical connections between applications.

session oriented protocol. A network protocol (such as TCP) that requires initialization before data can be exchanged, as well as some clean-up after data exchange has completed. Session oriented protocols typically offer error correction and packet reassembly, while connectionless protocols do not. See also: **connectionless protocol**.

shared medium. A **link-local** network where every node can observe the traffic of every other node.

Shorewall (*http://shorewall.net/*). A configuration tool used for setting up netfilter firewalls without the need to learn iptables syntax.

sidelobes. No antenna is able to radiate all the energy in one preferred direction. Some is inevitably radiated in other directions. These smaller peaks are referred to as sidelobes.

signal generator. A transmitter that emits continuously at a specific frequency.

Simple Network Management Protocol (SNMP). A protocol designed to facilitate the exchange of management information between network devices. SNMP is typically used to poll network switches and routers to gather operating statistics.

site-wide web cache. While all modern web browsers provide a local data cache, large organizations can improve efficiency by installing a site-wide web cache, such as Squid. A site-wide web cache keeps a copy of all requests made from within an organization, and serves the local copy on subsequent requests. See also: **Squid**.

slow blow. A fuse that allows a current higher than its rating to pass for a short time. See also: **quick blow**

SMA. A small threaded microwave connector.

SMB see **Server Message Block**

SmokePing. A latency measurement tool that measures, stores and displays latency, latency distribution and packet loss all on a single graph. SmokePing is available from *http://oss.oetiker.ch/smokeping/*

SNMP see **Simple Network Management Protocol**

Snort (*http://www.snort.org/*). A very popular open source intrusion detection system. See also: **Intrusion Detection System**.

SoC see **State of Charge**

solar module see **solar panel**

solar panel. The component of a **photovoltaic system** used to convert solar radiation into electricity. See also: **battery, regulator, load, converter, inverter**

solar panel array. A set of **solar panels** wired in series and/or parallel in order to provide the necessary energy for a given **load**.

solar power charge regulator see **regulator**

spectrum see **electromagnetic spectrum**

spectrum analyzer. A device that provides a visual representation of the electromagnetic spectrum. See also: **Wi-Spy**

Speed. A generic term used to refer to the responsiveness of a network connection. A "high-speed" network should have low latency and more than enough capacity to carry the traffic of its users. See also: **bandwidth**, **capacity**, and **latency**.

split horizon DNS. A technique used to serve different answers to DNS requests based on the source of the request. Split horizon is used to direct internal users to a different set of servers than Internet users.

spoof. To impersonate a network device, user, or service.

spot check tools. Network monitoring tools that are run only when needed to diagnose a problem. Ping and traceroute are examples of spot check tools.

Squid. A very popular open source web proxy cache. It is flexible, robust, full-featured, and scales to support networks of nearly any size. *http://www.squid-cache.org/*

SSID see **Extended Service Set Identifier**

SSL see **Secure Sockets Layer**

standalone photovoltaic system see **photovoltaic system**

State of Charge (SoC). The amount of charge present in a battery, determined by the current voltage and type of battery.

stateful inspection. Firewall rules that are aware of the the state associated with a given packet. The state is not part of the packet as transmitted over the Internet, but is determined by the firewall itself. New,