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NEWTON'S TELECOM DICTIONARY

**The Official Dictionary
of Telecommunications
Networking and
the Internet**

**16th
EXPANDED
& UPDATED
EDITION**

BY HARRY NEWTON

NEWTON'S TELECOM DICTIONARY

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WHERE THE TELECOM, NETWORKING AND INTERNET EXPLOSION IS COMING FROM

by Harry Newton

I wrote this book for those of us desperately trying to keep up, and for those of us new to this wonderful industry. No other industry is exploding as fast as telecommunications, networking, the Internet and the World Wide Web. No other industry is creating as many opportunities as telecommunications is. No other industry is creating wealth as fast as this incredible industry is. It's all coming from:

1. The Demand. Communications traffic worldwide is exploding — wired and wireless. Data and voice. Traffic on the Internet is doubling every 100 days. There'll be one billion people on line by 2005. Yet today — after the huge growth in Internet usage in the last few years — more people are actually gabbing away on cell phone networks than are surfing the Internet. The nature of ubiquitous quality communications has created the “virtual” corporation, with mobile employees carrying laptops, cellphones and pagers. This has led to a huge growth in virtual private corporate networks, fueling more demand. Every business in the industrialized world is setting up their own Web site — peddling and servicing their wares and buying their own raw materials over the Internet. More and more businesses are convinced they won't survive unless they have a Web site. Most They're right.

My phone company tells me their average “phone” call, when it was a voice call, was three minutes. Now it's an hour. I put a DSL — Digital Subscriber Line — into my house. It's 30 times as fast as my previous dial-up. Downloads that used to take me hours now take minutes. My DSL line is on all the time. It constantly brings me faxes, voice mail, email and alerts me to incoming phone calls. I do my shopping on my DSL line. I watch my stocks on the Internet. I do my research on them via my DSL line and the Internet. I read magazines and newspapers on the Internet via my DSL line. I talk to my children on the Internet. My wife and I arrange our social life via the Internet. My DSL's lightning speed and its immediacy — being on all the time — has changed my life. It (and other high-speed Internet access, like cable modems) will change yours.

2. Network speed is a narcotic. Stand on any New York City street corner with two sandwich boards, “Free Money” and “High Speed Internet Access.” Guess which one would get mobbed? The High Speed Internet Access. Everyone wants high-speed Internet Access. Demand for fast, reliable communications has barely been scratched anywhere in the world. My travels in the past year to Asia, Australasia and Europe confirm this. Everyone asks me “When will we get high speed Internet access in our homes and in our offices?”

3. The Increasing Digitization. This is relatively old, but speeding up. We started digitizing phone conversations 30 years ago for two basic reasons: First, it improved their quality. You were no longer amplifying the crud (static and noise) that long distance analog calls picked up. With digital, you regenerated the calls. You recreated them like new. Digitization made cross-world calls sound as clear as cross-office. Second, digitization make the whole process cheaper. Digital componentry is cheaper, and getting cheaper day by day. Digitization techniques — such as TDM, DWDM, packet switching, etc. — are simply more efficient and therefore cheaper.

4. The Hardware. The excitement centers on the dramatically improving price-performance of fiber optics (switching and transmission), digital signal processors and the high-speed routers of the Internet, now switching terabits of information each second. Fiber is amazing. No one knows how much capacity you can pump down one single fiber strand. In labs, we've sent 1,000,000,000,000 bits per second down a fiber strand a little thicker than one strand of your hair. It's totally awesome speed. That trillion bits per second (one million million bits per second) is enough to carry the entire world's Internet. That's the entire world's Internet traffic on one strand of fiber not much thicker than a strand of your hair.

Telecom's three building blocks — fiber, DSPs and routers — are improving about ten times faster in cost performance than computing's microprocessors and computer memory — silicon or magnetic. Though computing improvements get national publicity, telecom's are more impressive and faster. Telecom's annual cost-performance improvement blows away Moore's Law (defined under M) by a huge margin. Computing's cost-performance improvements get the publicity. But telecom's win the race.

5. New Standards. Ten years ago, the telecom industry was entirely closed. Every manufacturer had its own set of standards, proprietary to itself. You couldn't connect a Siemens phone to an Ericsson switch, or a Lucent phone to Nortel PBX. Telecom standards existed only at the very lowest levels — basic analog phone lines.

A persevering bunch of pioneers, coming chiefly from the computer industry, has pushed openings in the telecom industry, promulgating real, open standards that we can all use to build, Lego-style, new telecom products. These pioneers work in a hodge-podge of volunteer and semi-government bodies — from the ATM Forum to the ECTF, from GO-MVIP to the ITU-T, from ANSI to the Internet Engineering Task Force and to private companies, from Microsoft to Intel, from Cisco to Juniper Networks.

As a result, there's been an explosion of new telecom standards, defining everything from telecom operating systems, to buses that carry voice inside and outside PCs, to new, cheap ways of encoding voice digitally, to new high-speed lines, to new telecom "building block" software (called applications generators) and, of course, to IP Telephony — phone and fax calls over the Internet or Internet-like networks. Open standards lead to low prices, low barriers to entry and quick creation of new products. All this leads to explosive growth. We haven't seen nothing yet.

6. New Government Awareness That Competition Is Better Than Monopoly. The telecom industry has historically been closed — closed in architecture, closed to new suppliers, closed to new entrants. Telecom users have been mauled by high monopoly prices, typically those set by government phone companies. No longer. An example: A year after Germany deregulated its long distance calling, prices within Germany had dropped by 91%. That's a major drop!

The United States de-regulated in the late 1960s and 1970s. Canada followed quickly. Israel and Australia deregulated in 1997. Europe de-regulated in January, 1998.

Governments everywhere are waking to two powerful realizations: First, globalization is the most powerful economic force in the world today. Ignore it at your peril. Second, telecom is economic infrastructure. Companies and business go where globalization is friendliest and infrastructure is strongest. You can't have a modern development-friendly infrastructure and have a modern society when you have one bloated, glacial, government-run phone company charging ten times what phone companies a mile across the border charge. And you can't limit your entire country's telecommunications purchases to two or three gigantic, favored, cumbersome suppliers (as Europe, Japan and Australia had historically done). By the end of this century, European and Japanese telecom should be as open as and as cheap as North America is today. Then come India and China, also opening up.

7. New Startups. Telecommunications is the hottest place for venture capital. No industry in the world — neither software nor petroleum — can match the incredible profitability of the zero-marginal-cost telephone carrier. If I call from New York to California, my call costs my supplier — AT&T, MCI Worldcom, Qwest or whoever — basically nothing. All my carrier's costs are fixed. Other than the cost of billing me for my call, my carrier incurs no marginal cost for carrying my 3,000 mile call. Telecom is an incredible business. Even the oil business incurs variable costs. It must drag its raw materials out of the ground and schlep it to markets across the world. That costs labor, fuel and depreciation on tankers. Then it must be refined.

Nobody to this day knows how many conversations or how much information we can put down a single strand of fiber. Read the incredible developments in my definition of DWDM — Dense Wave Division Multiplexing. Add more photonics and electronics at the end. Put more calls down the fiber. More electronics. Photonic switching. More calls. More opportunities. No one knows what voice and video marvels the Internet can deliver. Large

images, animation and 3D graphics are about to proliferate on the Internet. We'll need more and more telecom bandwidth. Smart engineers are leaving big, sluggish telecom manufacturers in droves and starting new companies. There already are hundreds of "new telecom" millionaires. Soon, there will be thousands.

8. Dramatically Falling Prices. All the above brings dramatically lower prices. I mentioned Germany's 91% drop. Israel used to have the highest international calling prices of any developed country. Then the government in the late 1990s allowed in a handful of new carriers. The criterion for getting a permit was not financial, but simply how far you were prepared to drop your long distance and international prices. The carriers proposing the lowest possible prices won government approval. Within two weeks, international rates from Israel to the U.S. dropped 50%. By the end of the first year they had dropped 94%. Israel suddenly became the center of international callback (see my definition).

This new telecom environment is driving radically new paradigms into an erstwhile staid industry. Among them.

- **Because of fiber, long distance and international calling are becoming incredibly cheap.** As the world is increasingly fibered up, costs will continue to plummet. Communications will be postalized — one low price wherever you call. Soon we'll pay \$25 a month and call anywhere in the world and speak as long as we want, as often as we want. Flat rate calling everywhere.

One day we'll all be connected at high speed to the Internet all the time on whatever device we choose — our PC, our home LAN, our phone (wired or wireless), our PDA, our TV set. On The Net All The Time. Instant email. Instant news. Over the air TV brought us 5 channels. CATV (cable TV) brought us 50. Satellite TV brought us 500. Internet TV (movies on demand) will bring us 50,000. People will live and work where they choose.

- **Wireless will get more interesting.** Wireless has exploded because of digitization and digital techniques that enabled providers to cram many many times the number of users into the same sliver of bandwidth. Virtually all of today's wireless "conversations" are voice — people speaking to each other. But tomorrow, most wireless "conversations" will be data, as people send each other messages, receive their stock quotes, and surf the Internet. Essentially a wireless phone is a far better business tool than a wired phone and a wired PC. You can get in touch with your customers. They can get in touch with you, no matter where you are. A functioning accessible wireless phone obsoletes the aggravation of voice mail. Wireless is easier to deploy.

- **Load a Coke machine with a cell phone.** It can call when it's empty. It can raise prices when the temperature rises. Deploying a Coke machine with a cell phone is a lot faster than waiting for a landline to be installed. Wireless has a long way to go. I'm always comforted by the fact that there's far more spectrum waiting to be used than is presently used. The lack of wireless spectrum is a myth.

- **Telecom switching hardware will go through the same mainframe-to-client/server PC revolution that the computer industry went through in the past 20 years — with one big difference:** The telecom industry will skip the mini-computer generation. In telecom, we are very close to the "central office inside the PC." As competition and new technology arrives, the time to market new telecom features will drop from three years to three weeks. As telephone central offices move to shoe box size, so each desk will become its own central office, with individual telecom customization opportunities beyond anyone's wildest imagination. One day everyone's telephone system will be as personal as their PC. Telephone software will be available for downloading from the Internet or buying shrinkwrapped from your local Wal-Mart.

- **Voice, fax, imaging and video will migrate to and join data in one common IP network — the Internet and the corporate Intranet (the corporate equivalent of the Internet).** This will drive telecommunications pricing further down, add features and new capabilities (bandwidth on demand to the home, follow-me-find-me, etc.), It will shrink space, shrink time and vastly expand (and improve) every aspect of human endeavor — from remote education to business telecommuting, from remote medical diagnosis to high definition TV entertainment, from massive multi-user gaming adventures to serious understanding of our neighbors' failings (my tiny hope for world peace).

• **Ecommerce will explode.** Who would have imagined the 1992-1995 phenomenon which produced the democratization and commercialization of the Internet? Who could have imagined prime time TV showing www Web site addresses to the great unwashed American public on prime time TV. Who could have imagined dot com companies spending \$2 million a spot on the Super Bowl 2000. How easy mainstream America has accepted www addresses.

This Internet happening is, I believe, as important to the dissemination of knowledge and changing our lifestyles as the invention of the Gutenberg Press was in 1453. The Internet and the Web as a buying mechanism is immature — five years old. Physical shops are 5,000 years old. Even call centers are older (and more mature). As ecommerce matures in the next few years, it will become a totally pleasurable experience (it isn't at present), eclipsing in emotion and excitement anything physical shops have ever delivered. We'll have avatars — personal shoppers. We'll have web sites personalized to our needs. We'll have 3D movies of distant vacation spas we're interested in visiting. We'll have access to all the information about the products and services we're interested in — not the smatterings that are on today's Web. It will take time (and bandwidth). But the journey will be unbelievably rewarding, exciting and bubbling with serious business and personal opportunities.

• **This revolution will change the way we work more than any other.** The industrial revolution brought us into the city. But its primary by-products — the automobile and the highway — delivered pollution, downtown decay, urban crime and other unwanted problems. The low-energy, non-polluting "telecom" revolution is different. It gives each of us the opportunity to live where we choose — downtown Detroit, in the mountains of Colorado, or in Sri Lanka, where Arthur Clarke (inventor of the geosynchronous satellite) lives. More of us will telecommute. By the end of the year 2000, over 50% of Americans will not work out of conventional offices. They'll work out of their homes, their cars, their RVs, their hotels and their temporary offices.

This telecom revolution gives our cousins overseas grand new opportunities. As telecom calling costs plummet, the industrial world will export its service jobs, just as it exported its manufacturing jobs. U.S. airlines will answer their calls from U.S. customers in India, Nepal, China. Already, Microsoft, HP and Swissair have call centers in India and answer calls from customers in North America. They're already calling the Indian city of Hyderabad — Cyberbad.

I wish I were 30 years younger. The next 20 years in this — the most fantastic of all industries — will be totally incredible. Adjectives can't describe the excitement I feel.

Writing telecom dictionary updates every day and delivering new versions every six months is exhausting, exhilarating and very time-consuming. Claire and Michael, my children, and Susan, my wife, nag me, "Get a life!" I apologize to them for seeing so much of Daddy's back as he worked on this dictionary. I have to apologize to them.

HOW TO USE THIS DICTIONARY

This is a dictionary to work with every day. Companies give it to their new employees to bring them up the telecom and Internet learning curve. Salespeople include the definitions in proposals to customers. Novices love it

Blank Space	= ASCII 32	5	= ASCII 53
!	= ASCII 33	6	= ASCII 54
#	= ASCII 35	7	= ASCII 55
& (Ampersand)	= ASCII 38	8	= ASCII 56
-(Hyphen or dash)	= ASCII 45	9	= ASCII 57
. (Period)	= ASCII 46	:	= ASCII 58
/ (Forward slash)	= ASCII 47	;	= ASCII 59
0 (zero)	= ASCII 48	A (capital A)	= ASCII 65
1	= ASCII 49	Capital letters to ASCII 90	
2	= ASCII 50	\ (back slash)	= ASCII 92
3	= ASCII 51	Lower case letters	
4	= ASCII 52	start with a	= ASCII 97

because it cuts through the clutter. Users explain telecom things to their boss. Management uses it to understand telecom technicalities. Lawyers even use it in court. Sometimes they rely on it. God help the justice system.

Give my dictionary to your new employees, your users, your customers, your prospective customers, to your boss. Give it to your kids to let them understand what you do. They'll understand why you, too, have no life.

Most technical dictionaries define terms tersely, often in other technical terms. As a result they leave you more confused. This dictionary is different, deliberately so. My definitions tell you what the term is, how it works, how you use it, what its benefits are, what its negatives are. I tell you how it fits into the greater scheme of things, and I occasionally sound warnings or issue buying checklists. And sometimes I include a few fun definitions — mainly to amuse myself, but hopefully to give you some pleasure. Skim. You'll find them.

HOW THIS DICTIONARY IS ORGANIZED

My definitions are a combination ASCII / alphabetical order. Definitions containing non-letters — like @, #, / and numbers — are in ASCII order. Definitions with real letters are in alphabetical order. I use ASCII because it gives order to hyphens, periods, forward slashes, numbers, etc. Here is the order you'll find in this dictionary:

HOW THE DICTIONARY SPELLS

My dictionary conforms to American spelling. To convert American spelling to British and Canadian spelling typically requires adding a second "L" in words like signaling and dialing (they're American) and changing "Z" in words like analyze to analyse. Center in American is Centre. In Britain, Europe, Australia and Canada, it's Centre. This dictionary contains more British, Australian and European words than my previous editions — a result of several overseas lecture tours.

WHAT STYLE THIS DICTIONARY FOLLOWS

All high-tech industries make up new words by joining words together. They typically start by putting two words next to each other. Later, they join them with a hyphen. Then, with age and familiarity, the hyphen tends to disappear. An example: Kinder garten. Kinder-garten. and now Kindergarten.

Sometimes it's a matter of personal choice. Some people spell database as one word. Some as two, i.e. data base. I prefer it as one, since it has acquired its own logic by now. Sometimes it's a matter of how it looks. I prefer T-1 (T-one), not T1, simply because T-1 is easier to recognize on paper. I define co-location as co-location. Webster's spells it collocation, with two Ls, one more than mine. I think mine is more logical. And Mr. Webster is dead. He can't argue with me.

Plurals give trouble. The plural of PBX is PBXs, not PBX's. The plural of PC is PCs, not PC's, despite what the New York Times says. The Wall Street Journal and all the major computer magazines agree with me. The plural possessive is PBXs' and PCs', which looks a little strange, but is correct. In this dictionary, I spell the numbers one through nine. Above nine, I write the numbers as arabic numerals, i.e. 10, 11, 12, etc. That conforms to most magazines' style.

Sometimes the experts don't even get it right. Take something as common as 10Base-T. Or is it 10BaseT? 10Base-T thing is an IEEE standard. So you'd think they'd know. Forget it. Go to their web site, www.ieee.org. You'll find as many hits for 10Base-T as for 10BaseT. Ray and I checked every known and unknown expert in the Western world (i.e. those living within a block or two of Ray). We now believe the correct spelling is 10Base-T.

Sometimes, I don't simply know. So I may list the definition twice — once as two separate words and once as one complete word. As words and terms evolve, I change them in each edition. I try to conform each new edition to "telecomese" and "Internetese" as it's spoken and written at that time.

BITS AND BYTES PER SECOND. ALL ABOUT SPEED

Telecom transmission speed has confused many of my readers. Read this. I hope this will help:

The telecom and computer literature is loaded with references to Bps and bps. You'll see them as Kbps or KBps, or Kbits/sec. You'll see them as Mbps or MBps. You'll see them as Gbps or GBps. Not much consistency. Let me explain:

First, k means Kilo or a thousand. M means mega or one million. And g means giga, which is a thousand million, or 1,000,000,000. The term kbps means a thousand bits per second. And that's a telecom transmission term meaning that you're transmitting (and/or receiving) one thousand bits in one second.

KBps (with a big B) means one thousand bytes per second. That's a computer term. And it usually refers to speeds inside the computer, e.g. from your hard disk to your CPU (central processing unit — your main microprocessor). There's a big difference between a bit and a byte. A byte is eight bits.

That's the way it's meant to be. But, there's a lot of sloppy writing out there. You'll see MBps or MB/s also meaning one million bits per second as a telecom transmission speed. You really have to figure out if the writer means telecom transmission — i.e. anything outside the computer — or if it's internal to the computer in which case it's bytes and a computer term. You can usually tell from the context.

Measuring the speed of a communications line is not easy. And tools to measure lines are still very primitive. Look at the strange speed reports you get from Microsoft Windows Dial-up Networking, or from its reports of download speeds. Notice how inconsistent Microsoft is about measuring speed. About the only certain thing you know is that the speed of a circuit is always measured by the slowest part of the circuit. Look at the Internet. You might be getting horribly slow downloads, despite being on a T-1. That might be due to a horribly overloaded server at the other end or it might be due to the fact that your T-1 is overloaded with other users at the office, also downloading. These days with faster lines what's often a gating factor is the speed of your PC. It may be simply not be fast enough for your PC's browser to keep up with the speed of your incoming bits. In which case you need a faster PC — it happened at our home when we got the DSL line. We had to upgrade to faster machines.

Virtually all telecom transmission is full duplex and symmetrical. This means if you read that T-1 is 1,544,000 bits per second, it's full duplex (both ways simultaneously) and symmetrical (both directions the same speed). That means it's 1,544,000 bits per second in both directions simultaneously. If the circuit is not full duplex or not symmetrical, this dictionary points that out. For now, the major asymmetrical (but still full duplex) circuit is the xDSL family, starting with ADSL, which stands for asymmetric, which means unbalanced. The DSL "family" no longer starts with "A," and most of it (but not all of it) is still asymmetrical. The one major exception, SDSL (Symmetrical Digital Subscriber Line) is clearly symmetrical.

There's one more complication. Inside computers, they measure storage in bytes. Your hard disk contains this many bytes, let's say eight gigabytes (thousand million bytes). That's fine. But they're not bytes the way we think of them in internal computer transmission terms. They're different and they have to do with a way computer stores material — on hard disks or in RAM. They're what I call "storage bytes." When we talk 1 Kb of storage bytes, we really mean 1,024 bytes. This comes from the way storage is actually handled inside a computer, and calculated thus: two raised to the power of ten, thus $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1,024$. Ditto for one million, two raised to the power of twenty, thus 1,048,576 bytes. See also BPs.

WHICH WORDS GET DEFINED?

Which words get defined? These are my rules: All the important terms in the field. No proprietary products, i.e. those made by only one firm. No proprietary terms. My rules are not precise. Writing a dictionary is very

personal. I read over 100 magazines a month. I study. I cogitate. I try to understand. Eventually, my wife calls, "Enough with the words, already. It's 2:00 AM. Time to sleep."

HOW THIS DICTIONARY HANDLES PLURALS

Plurals give trouble. The plural of PBX is PBXs, not PBX's. The plural of PC is PCs, not PC's, despite what the New York Times says. The Wall Street Journal and all the major computer magazines agree with me. The plural possessive is PBXs' and PCs', which looks a little strange, but is correct. In this dictionary, I spell the numbers one through nine. Above nine, I write the numbers as arabic numerals, i.e. 10, 11, 12, etc.

There are no rights or wrongs in the spelling business, except that my dictionary is now the correct way of spelling telecom words. My dictionary is correct, because it's the biggest seller (by far). Lawyers use it in court. They get judgments based on what's in my dictionary. Or what was in my dictionary. They often call me and beg me for a ten-year old copy of my dictionary. I always put an outrageous price on my "precious personal library" copies. Sometimes they pay. Most times they don't. Cheaper people you'll rarely find.

A OR AN? HERE'S THE LOGIC

I admit my fallibility. This edition of this book is riddled with "a" when it should be "an" and "an" when it should be "a." I've never been confused. I always believe "an" is used before vowels, and "a" before consonants. Not so, says my friend, Jay Delmar, who edits technical documentation. Here's his explanation.

Concerning the problem of what article ("a" or "an") should be used with a word or an acronym, it all depends on how the acronym is pronounced, that is, whether it's pronounced as a string of letters or as a word. In some cases, the article would be the same. In others, the form would have to switch. Usually "an" is used before vowels, but some consonants require it as well, and some vowels require an "a." It all depends on the sound. Whether a letter is intrinsically a vowel or a consonant doesn't really matter; what matters is if it's pronounced as a vowel or a consonant in the particular context.

If an acronym is pronounced as a string of letters, the following shows the appropriate article to use with the first letter of the acronym:

An A	A J	An S
A B	A K	A T
A C	An L	A U
A D	An M	A V
An E	An N	A W
An F	An O	An X
A G	A P	A Y
An H	A Q	A Z
An I	An R	

If an acronym is pronounced as a word, the article might need to change:

An RS-232, but a RAM (pronounced "ram")
An STP, but a SRDM (pronounced "sardem") and a SLC (pronounced "slick")
An FTP, but a FAIC (pronounced "fackey")
An HIC, but a HICUP (pronounced "hiccup")

According to The New York Public Library Writer's Guide to Style and Usage, "The article a is used before all consonant sounds, including a sounded h, a long u, and an o with sound of w (as in one). The article an is used before all vowel sounds except a long u and before words beginning with a silent h." This definition has never helped me because I've never really understood why in "an STP" the "s" sound is a vowel sound and in "a SRDM" the s sound is a consonant sound. Basically, I rely on my ear.

The real trouble, of course, is that unless one is really, really familiar with the acronym, one doesn't know how it's actually used: pronounced as a string of letters or as a word. I thought SIPL would be "an SIPL" (an ess-eye-pea-ell) until fairly recently. I didn't know it was pronounced "a sipple"-or "a sighpull" (I've heard it both ways).

Jay makes sense. I'm going to try to be more in line with his concepts in upcoming editions. But this one may have a few inconsistencies.

THANK YOU FOR HELP ON THIS DICTIONARY

A big "Thank You" to the dozens of people and dozens of companies who helped. If I left you out, I apologize.

Among the manufacturers, special thanks to Amdahl, Anixter, Aspect Telecommunications, AT&T, Dialogic, Ecos Electronics, General Cable, Intel, Lucent, Micom, Microsoft, MCI, NEC, Newbridge Networks, New York Telephone (now Bell Atlantic), Northern Telecom (now Nortel), Racal Data, Ricoh, Sigma Designs, Sharp and Teknekron. Among the magazines I borrowed (or stole), the best were PC Magazine and Teleconnect, Call Center, Computer Telephony and Imaging Magazines. Special thank yous also to internetworking expert, Tad Witkowicz at CrossComm, Marlboro MA.; to Russ Gundrum, Network Engineering Manager - Transport at Southwestern Bell in Bellaire, TX; to Stephan Beckert of The Strategis Group in Washington, D.C.; to Ken Guy erstwhile of Micom, Simi Valley (near LA); to Robert M. Slade, who does a wonderful job reviewing books (including this one); Frank Derfler of PC Magazine; Chris Gahan of 3Com; to Bob Rich of Boeing's System Engineering Group, who's studying for his MCSE; to Glenda Drizos, Enhanced 911 Project Leader at Sprint PCS, Overland Park, Kansas.

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came to fix a busted line and left educating me on the intricacies of cable naming at his company; to Ed Margulies at Miller Freeman, New York, NY who's written so many fine books on computer telephony; to Charlie Peresta, P.E., PMP, Telecommunications Manager, Intellisource who helped me with some of the telecom energy terms.

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If I've left any definitions out, or if some of my definitions are unclear, contact me on Harry_Newton@TechnologyInvestor.com

I wrote this dictionary on a series of ever-newer, ever-faster Toshiba laptops (very reliable machines) using The Semware Editor, a very beautiful text editor, which Sammy Mitchell of Marietta, GA wrote, and which I wholeheartedly recommend — www.semware.com. The Toshiba laptop for this dictionary was the Toshiba Portege 7020CT. It's a 366 Mhz Pentium II machine with 128 Meg of RAM and a six gigabyte removable hard disk. Jennifer Cooper-Farrow and Christine Kern typeset it on a Power PC Macintosh using QuarkXpress and Adobe Illustrator. I welcome comments, corrections, suggestions, improvements.

If you're wondering what I'm doing now, please visit www.HarryNewton.com and www.TechnologyInvestor.com

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P22 Format An enchanted version of the P2 format that appeared in the 1988 X.400 standard.

P2T Pulse to Tone & Rotary Dial Recognition products.

P35 Format The EDI (Electronic Data Interchange) message header enhancement to X.400 that enables EDI-specific addressing, routing and handling of EDI messaging. Defined in 1990 in the X.435 standard.

P802.11 P802.11 is a series of evolving standards in the wireless Local Area Network arena. The IEEE Program P802.11 Standards Working Group aims to define universal protocols for wireless LANs in the 900 MHz, 2.4 GHz and infrared frequency bands. Main components in the 802.11 standard are twofold: 1. The physical specifications for medium-dependent protocols. There are different physical specifications for each frequency band supported in 802.11. 2. The Medium Access Control (MAC) specifications for ad-hoc wireless networks and wireless network infrastructures. A single medium-independent MAC protocol provides a unified network interface between different wireless PHYs (Physical Specifications) and wired networks.

PA Public Address. Loud speaker system, sometimes used for paging.

PABX Private Automatic Branch eXchange. Originally, PBX was the word for a switch inside a private business (as against one serving the public). PBX means a Private Branch Exchange. Such a "PBX" was typically a manual device, requiring operator assistance to complete a call. Then the PBX went "modern" (i.e. automatic) and no operator was needed any longer to complete outgoing calls. You could dial "9." Thus it became a "PABX." Now all PABXs are modern. And a PABX is now commonly referred to as a "PBX."

PAC Personal Activity Center. A combination IBM PC clone, alarm clock, answering machine, speakerphone, fax machine, modem, compact-disk player and AM/FM radio all rolled into one unit sitting on your desk.

Pac Bell Pacific Bell, the California Bell Operating Company (BOC) which, along with Nevada Bell, formed Pacific Telesis (PacTel). PacTel was one of the seven original Regional Bell Operating Companies (RBOCs) formed in 1984 by the Modified Final Judgement (MFJ). As PacTel was acquired by SBC Corporation (Southwestern Bell) in 1996, Pac Bell is now a subsidiary of SBC.

Pacific Telesis One of the seven, now-independent Regional Holding Companies formed at the Divestiture of AT&T of 1983. It holds Pacific Bell, Nevada Bell and several non-regulated subsidiaries. In 1996, SBC Corporation bought Pacific Telesis.

Pacing Controlled rate of flow dictated by the receiving component, to prevent congestion. A method of flow control in IBM's SNA. See Pacing Group.

Pacing Algorithm The mathematical rules established to control the rate at which calls are placed by an automatic dialing machine, also called a predictive dialer. See Predictive Dialer.

Pacing Control SNA term for flow control. See Pacing Group.

Pacing Group In IBM's SNA, the number of data units (Path Information Units, or PIUs) that can be sent before a response is received. An IBM term for window.

Pack To compress data items so they take up less space. A process used by many database programs to remove records marked for deletion.

Packet 1. Generic term for a bundle of data, usually in binary form, organized in a specific way for transmission. The specific native protocol of the data network may term the packet as

Generic Format of a Data Packet STX=Start of Text EXT=End of Text



a packet, block, frame or cell. A packet consists of the data to be transmitted and certain control information. The three principal elements of a packet include: 1. Header — control information such as synchronizing bits, address of the destination or target device, address of originating device, length of packet, etc. 2. Text or payload — the data to be transmitted. The payload may be fixed in length (e.g., X.25 packets and ATM cells), or variable in length (e.g., Ethernet and Frame Relay frames). 3. Trailer — end of packet, and error detection and correction bits. See also Block, Cell and Frame.

2. Specific packaging of data in a packet-switched network, such as X.25, Frame Relay or ATM. A true packet-switched network such as X.25 involves packets of a specific and fixed length. In a public packet switched network, such packet payloads originally were specified as being either 128B or 256B, where B=Byte. In later versions of the standards, that packet size was increased to a maximum of 4,096B, although the packet payload size generally does not exceed either 512B or 1024B. The larger packet size traditionally is used in airline reservation systems and other applications where relatively large sets of data routinely are transmitted. A X.25 packet prepends the payload with header information including a flag of eight bits; the flag denotes the beginning of the packet and also serves to assist the network nodes (packet switches) in synchronizing on the rate of transmission. An address field of eight bits also prepends the payload, with four bits identifying the target device and four bits identifying the transmitting device. Control data of eight-to-sixteen bits comprise the last element of the header; included in control data is the packet number in order that the network nodes might identify and correct for lost or errored packets. Appending the payload is a trailer consisting of a Cyclic Redundancy Check (CRC), which is used by all packet nodes for purposes of error detection and correction. See ATM, CRC, Frame Relay, Packet Assembler/Disassembler (PAD), X.25.

Packet Assembler/Disassembler PAD. A hardware/software combination that forms the interface between a X.25 network such as PDN and an asynchronous device such as a PC. The PAD generates call request, call clear, and other information packets in addition to the ones that contain user data. The PAD is responsible for packetizing the data from the transmitting device before it is forwarded through the packet network. On the receiving end of the transmission, the PAD strips away the control information contained in the header and trailer in order to get at the original text or payload, in effect disassembling the packets and reconstituting the original set of data in its native or original form. The PAD may be in the form of a standalone DCE device on the customer premise and supporting one or more terminals, or in the form of a printed circuit board which fits into an expansion slot of the terminal. Smaller users generally rely on the carrier to provide the PAD, which is embedded in the packet switch.

Packet Buffer Memory set aside for storing a packet awaiting transmission or for storing a received packet. The memory may be located in the network interface controller or in the

Personal Information Manager PIM. Software application which allow the user to organize personal information. similar to an appointment book but personalized and programmed into the PC. PIMs now support Caller ID. When the phone rings, the phone system passes the calling number to the PC, which does a lookup in the PIM on the phone number and throws information about the caller up on screen.

Personal IVR An Interactive Voice Response system running on your own personal PC and designed to serve the needs of only one person. See IVR.

Personal Line A feature which allows specific key telephones to have their own private Central Office line. Sometimes called an AUXILIARY LINE. You can typically receive and make calls on this line. No one else can answer it, since it does not appear on any other phone instrument in the office. You can give this number to your wife or girlfriend. It is not a good idea to give it to both.

Personal Name An X.400 term for a standard attribute of an O/R (Originator/Recipient) Address form that identifies a person relative to another attribute (e.g., an organization name). The personal name may include surname, given name, initials, and generation qualifier. Initials consists of the first letter of all the user's names except the user's surname.

Personal Productivity Tool Another term for a computer. John Perry Barlow thinks the expression was created by the "druids" who run Microsoft and Apple. Mr. Barlow is a cattle rancher, computer hacker, poet, and a lyricist for the rock band The Grateful Dead.

Personal Speed Dial Simplified ways of dialing. You do them by dialing a couple of digits. Or you punch in a button at your phone. Personal Speed Dial codes are programmed for each telephone, and can only be used at the telephone on which they are programmed. System Speed Dials, in contrast, can be used from every phone in the system.

Personal System/2 PS/2. IBM's current family of microcomputers some of whom sport one major difference from its predecessors, namely the existence of a 32-bit micro-channel bus. This "bus" serves the same purpose as a PBX's backplane — namely to move information from the printed circuit cards and to other printed circuit cards, which may contain their own individual microprocessors (computers on a chip) and which may communicate with the outside world through their own communications ports.

Personal Telephone The category of cellular telephones pioneered by Motorola's Pan American Cellular Subscriber Group with the introduction of the MicroTAC Digital Personal Communicator Telephone. Weighing less than one pound, they are so compact and lightweight, they fit comfortably into a shirt pocket or purse making them "body friendly."

Personal Wireless Telecommunications PWT. Also known as Personal Wireless Telephony. A U.S. cordless telephony standard for in-building wireless communications systems, PWT is a variant of the DECT (Digital European Cordless Telecommunications) standard. PWT is an air interface which operates in the unlicensed PCS (Personal Communications Services) 1.9 GHz radio band. PWT(E) is an enhanced version which operates in the licensed PCS bands. See also Air Interface, DECT, and PCS.

Personality Module A small motherboard added to a voice board to give it the "personality" of a proprietary electronic PBX telephone. "Personality" means electrical characteristics and the same button configuration and responsiveness, all of which can be recreated on the screen of a PC which has the voice board installed.

Personalization Technology Software that lets suppliers of information to "nonintrusively" (their word, not mine) learn the individual interests of their customers in order to deliver personalized Web content, targeted advertising, and product recommendations.

Personalized Ringing A telephone feature which allows you to select different ringing sounds for your telephone. This feature is useful if you work in a big room with lots of other people and it's hard to tell whose phone is ringing.

PERT Project Evaluation and Review Technique. A variation on the Critical Path Method of organizing the completion of projects. Projects are examined for the their worst, best, average completion times. A critical path is determined and overall standards for completion times are created. The PERT technique was created by the military. It is used for organizing complex tasks.

PES Packetized Elementary Stream: In MPEG-2, after the media stream has been digitized and compressed, it is formatted into packets before it is multiplexed into either a Program Stream or Transport Stream.

Petabyte PB. A combination of the Greek "pente," meaning "five," and the English "bite," meaning "a small amount of food." A unit of measurement for physical data storage on some form of storage device — hard disk, optical disk, RAM memory etc. and equal to two raised to the 50th power, i.e. 1,125,899,906,842,600 bytes.

KB = Kilobyte (2 to the 10th power)
MB = Megabyte (2 to the 20th power)
GB = Gigabyte (2 to the 30th power)
TB = Terabyte (2 to the 40th power)
PB = Petabyte (2 to the 50th power)
EB = Exabyte (2 to the 60th power)
ZB = Zettabyte (2 to the 70th power)
YB = Yottabyte (2 to the 80th power)

One googolbyte equals 2 to the 100th power.

PF Xfer Power Failure Transfer.

PFM Pure F...ing Magic. A term to indicate that it works but the software engineer has no real idea how it works. It works by PFM. Sort of like an accidental winning shot in tennis. Looks great. The hitter won the point, but he had no idea how he did it. See PFTS.

PFOC Pending the Firm Order Commitment.

PG Peer Group A set of logical nodes which are grouped for purposes of creating a routing hierarchy. PTSEs are exchanged among all members of the group.

PGA Programmable Gain Amplifier, a part of the Analog Front End.

PGL Peer Group Leader: A single real physical system which has been elected to perform some of the functions associated with a logical group node.

PGP PGP stands for Pretty Good Privacy. It is a cryptography program for computer data, electronic mail and voice conversations. PGP was written in 1991 by Philip R. Zimmermann, who gave the software away. It was posted on a public computer on Internet and thousands have downloaded copies of it. So far, according to the New York Times Magazine, June 12, 1994, no one has been able to crack information encoded with PGP. Originally, PGP was just used for the transmission of computer data and electronic mail. Then it got extended to voice conversations on the phone, called PGPhone. The idea is that you use modems to dial. Then the PCs "shake hands" and jointly agree on a complex number that is plugged in a scrambling algorithm equation. This notoriously complex scrambling algorithm, called Blowfish, recalculates the digital