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Telecom Dictionary

Ray Horak

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To Margaret

for whom my love is infinite and eternal

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Ray Horak is president of The Context Corporation, an independent consultancy specializing in telecommunications and data communications systems and networks. Well-known for translating highly technical subject matter into plain-English, commonsense terms, he has written hundreds of articles and columns on various aspects of telecommunications. This is his fifth book for Wiley. He teaches public and private seminars on various telecommunications subjects and is a popular speaker at industry events. He also serves as an expert consultant and witness in litigation involving intellectual property matters such as patent infringement and trademark/service mark infringement as well as product/service misrepresentation.

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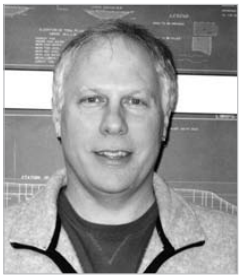

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CONTENTS

Acknowledgments xv
Introduction xvii

Telecom Dictionary A–Z 1–560

Appendix A: Standards Organizations and Special Interest Groups (SIGs) 561

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A work of this magnitude is not a simple matter. It is the culmination of more than 35 years' combined experience in telecommunications and incorporates knowledge drawn from thousands of articles and Web sites and hundreds of books. Most of those sources are very recent, but some of the books are more than 100 years old and still relevant for context, if not for their descriptions of contemporary cutting-edge technologies. My thanks to all those authors who went before me and variously put ink to paper or fingers to a keyboard.

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We all worked together to make this book as good as it is, and we think it is very good. Ultimately, of course, the responsibility for any errors and omissions is mine, and mine alone. If you have any suggestions for improving it, please address them to me (ray@contextcorporation.com).

INTRODUCTION

We live in a complex world that increasingly is defined by information technology, by which I do not mean classical data processing but rather the creation, storage, and distribution of all forms of information, including audio, text, image, and video. In combination, such information becomes multimedia in nature. Computers of one sort or another are used to capture and create much of that information, which is remarkable in itself, but the value of the data is largely dependent on our ability to share it with others. Robert Metcalfe, who invented the Ethernet local area network in 1973, clearly recognized the value of networking resources. Metcalfe's Law states that the value of a telecommunications network is proportional to the square of the number of users (n^2) of the system. (I think Alexander Graham Bell clearly recognized the same relationship roughly 100 years earlier, but he failed to state it in the form of a law, or even a theory.) Information, of course, is our most valuable resource and telecommunications systems and networks allow us to share it with others.

In the 97 years between Bell's invention of the telephone and Metcalfe's invention of the LAN, there was a lot of technological progress, and the pace has increased markedly since. Copper wires have given way to glass fibers in the WAN backbone, and fiber optics is now making its way into the local loop. Coaxial cable has been obsoleted in the LAN by twisted pair, glass and plastic optical fiber, and now RF technologies. Wireline technologies have yielded to or are supplemented by wireless in many applications, not only in the LAN, but also in the MAN and WAN. Some estimates now place the number of cellular telephones worldwide at over two billion, which means that there are more cellular telephones than landlines. Since its invention in 1877 and for well over 100 years, circuit switching was the sole method by which telephone calls were connected, but is now rapidly being replaced by packet switching. There seems to be no question that Voice over Internet Protocol (VoIP) technologies will obsolete the traditional circuit-switched PSTN. Since its origins in the late 1960s as a closed network for academics and intellectuals working on projects for the U.S. military, the Internet has been commercialized and made available to the general public. The Internet now comprises over 60,000 networks connecting nearly 395 million host computers in more than 150 countries. On a daily basis, the Internet handles more than 84 billion e-mail messages and total traffic of approximately 5,175 petabits. It is in large part due to the popularity of the Internet and the World Wide Web that so many millions of miles of optical fiber have been deployed and that the available bandwidth has reached such incredible and even indescribable proportions.

All of these and many other relevant technologies build in some way on those that came before and each adds to the vocabulary of telecommunications a set of terminology, along with the seemingly requisite abbreviations, acronyms, contractions, initialisms, and portmanteaux. Many of these have multiple definitions, sensitive to historical or technological context. *Broadband*, for example, has one set of definitions in a WAN context, but quite another in the LAN domain. *Carrier* also has several definitions, as do *buffer* and *ATM*, and there are at least four kinds of *cells*. Some acronyms really aren't acronyms at all — ISO comes to mind. The origin of some terms is fascinating, with *bug* and *ping* being good examples. Some definitions in this book are very short, such as *plug*, whereas some are more like mini-tutorials, such as *SONET* or *frame relay*. Some definitions are highly relevant, whereas others are only marginally so, and still others have no relevance to telecom whatsoever, but I find them interesting. *Rules of engagement*, for example, is a term I find fascinating and I think you will, as well. Also fascinating are the cross-references from *rules of engagement* to *Geneva Convention* and *warrior's code*. Most terms are cross-referenced, which you will find to be of great value. Some terms are just for fun, so I hope you have a sense of humor. Check out

euphemism and *OCD* as examples. If you don't find them funny, just skip over them and forgive me, but please don't get the impression that I take this book lightly. I take my job very seriously. I also enjoy what I do, and I try to have a little fun with it now and then.

I hope that you enjoy the book and find it valuable. This is not an open-source dictionary. I wrote every word of it and I am solely responsible for its content, which is how I know that it is correct and objective. However, please feel free to contact me if you have a suggestion for a correction or perhaps an additional term. I plan many more editions of this book and intend for each to be bigger and better.

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home page Also known as *page* and *Web page*. A document that serves as a starting point on a Web site. A home page typically contains hypertext and navigation buttons that allows the user to navigate the site by clicking them with a mouse and invoking hyperlinks to other pages and even other sites. See also *hyperlink*, *hypertext*, and *WWW*.

HomePlug A set of standards for in-house broadband over power line (In-house BPL). HomePlug allows a device to connect to a LAN directly through the in-building low voltage (LV) electric lines (110 volts at 50–60 Hz, or 220 volts at 50 Hz). Loosely based on Ethernet standards and using a variation of the CSMA/CA access control technique, HomePlug 1.0 supports up to 16 nodes sharing bandwidth up to a theoretical maximum of 14 Mbps. HomePlug-compatible devices include PCs, routers, bridges, switches, and any other devices that use RJ-45 or universal serial bus (USB) physical interfaces. The devices plug into a HomePlug adapter that is about the size of a typical LV transformer or power adapter, and that plugs into any electrical outlet on the premises. HomePlug uses of a version of orthogonal frequency division multiplexing (OFDM) specially tailored for powerline environments. HomePlug 1.0 specifies 84 equally spaced subcarriers, within each of which several differential modulation techniques are employed. Security is through 56-bit Data Encryption Standard (DES). Attenuation in HomePlug networks is influenced not only by signal propagation through the copper conductors, but also by splices and various components such as fuse boxes, surge suppressors, and circuit breakers. HomePlug currently offers a range of as much as 300 meters without repeaters and deals with issues of electromagnetic interference (EMI) through the mechanisms of forward error correction (FEC) and automatic repeat request (ARQ). See also *Access BPL*, *bandwidth*, *BPL*, *broadband*, *CSMA/CA*, *DES*, *EMI*, *Ethernet*, *FEC*, *In-house BPL*, *LAN*, *modulation*, *LV*, *OFDM*, *propagation*, *RJ45*, *subcarrier*, *transformer*, and *USB*.

home run An inside cable and wire star configuration in which each telephone or data jack connects directly to a common point, such as a demarcation point (demarc), wiring closet, or key service unit (KSU). The alternative is a shared loop that connects multiple jacks to one or two pairs that connect to the demarc or KSU. See also *daisy chain* and *loop*.

hook switch See *switch hook*.

hoot **1.** shout, or holler. **2.** Something or someone hilarious, as in "Billy Bob is a real hoot, don't y'all reckon?" See also *hoot 'n' holler*.

hoot and holler See *hoot 'n' holler*.

hoot 'n' holler An always-on two-way voice system that operates on a point-to-point or point-to-multipoint basis over physical four-wire dedicated circuits, with one transmit pair and one receive pair. A hoot 'n' holler system operates much like a full duplex paging system or intercom system. A typical application allows front desk or service counter personnel to press a button on a handset or a speakerphone and establish a point-to-multipoint connection to speakers, also known as *squawk boxes* or *holler horns*, positioned throughout the manufacturing or assembly floor, or the warehouse, where the personnel can respond by hooting (shouting) and hollering (shouting) into one of the microphones positioned around the area. Telephone companies use hoot 'n' holler systems to contact and converse with central office personnel who can just holler back rather than stopping what they are doing, perhaps climbing down a ladder, and running to answer a telephone, or perhaps just ignoring the call altogether. In such an application, multiple central office systems might be connected back to a central test and dispatch center by dedicated four-wire circuits. Financial and brokerage firms make extensive use of hoot 'n' holler systems for communicating market updates and instructions to brokers and traders on the trading floor. News agencies, publishers, power plants, refineries, and salvage yards all make extensive use of such systems.

hop **1.** A small, quick jump. **2.** In networks, the journey a signal makes across a transmission link between two devices such as bridges, hubs, switches, or routers. There often are multiple links in an end-to-end circuit between two devices. Therefore, a frame may make multiple hops as it transverses a physical path from one workstation to another. An IP packet typically makes a significant number of hops as it