

Words and ideas by
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A Work Sample

- TITLE:** Internet Study Guide
- FORMAT:** Printed study guide to be used in conjunction with the book *How the Internet Works*, Preston Gralla, Millennium ed. Indianapolis: Que, 1999. This is the first nine of 91 pages.
- CLIENT:** Multacom, a tier-one Internet company
- PURPOSE:** Provide orientation to new employees in non-technical positions. The goal, in addition to providing technical training, was to demonstrate how to think in terms of how Multacom can help its customers to be more successful in their own business efforts; driving home the message that Multacom succeeds to the extent that we help our customers succeed.

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Introduction

The MULTACOM way of doing business is to work with our customers as business partners. Remember that all business operators want four things from their efforts summed up with the word CARE:

- C. They want to be Competitive.*
- A. They want to Add to their bottom line profits.*
- R. They want to Retain their customers, once acquired.*
- E. They want to Expand their market share.*

MULTACOM helps provide this CARE by meeting or exceeding their expectations for:

- Rock-solid high-bandwidth service.
- Highly responsive technical support that does whatever it takes to keep their network or Web site up and running.

We then go beyond expectations to help set MULTACOM apart by:

- Making every effort to understand the customer's business AND their objectives.
- Tailoring MULTACOM services to better meet the customer's business needs.
- Taking initiative in suggesting how MULTACOM can better contribute to the customer's success.

This extra level of CARE and service gives MULTACOM the competitive advantage that is helping us grow as a company.

It /s Your Job

Imagine contacting a company with a concern about your car, your insurance or maybe about healthcare you may need. Every time you hear, "I can't help you with that," your satisfaction with that company drops. Now imagine that every person you talk with at that company:

- Takes a sincere interest in your concern.
- Is surprisingly knowledgeable, even though your concern may be outside of their specific job responsibilities.
- Addresses as much of your concern as they can before referring you to someone who is more knowledgeable in the appropriate area.

This level of “customer experience” would be reassuring. It would earn your trust and build your loyalty. This is exactly what MULTACOM’s commitment to partnering accomplishes. And delivering on this commitment is your job, just as it is part of the responsibility of every MULTACOM employee.

Of course, everyone can’t be an expert on everything MULTACOM offers. But we do expect you to:

- Learn enough about Internet basics to intelligently discuss how MULTACOM helps our customers.
- Think about any concern expressed by a customer, so that you can refer them to the appropriate expert with an absolute minimum of inconvenience.
- Care about every customer and do what it requires to enhance their customer experience.

This study guide will help you to meet those expectations. And yes, making the customer experience the best it can possibly be *is* your job.

Self-Paced Learning

This study guide is to be used with the books:

- *How the Internet Works*, Preston Gralla, Millennium ed. Indianapolis: Que, 1999.
- *Newton’s Telecom Dictionary*, Harry Newton, 16th ed. New York: Telecom Books, 2000.

Each of the fifty chapters in *How the Internet Works* has its own section in this study guide. For each chapter:

- Read the chapter introduction in this study guide. It will help you understand how what you are about to read applies to the services that MULTACOM provides to our customers.
- Read the chapter.
- Answer the study questions
- Take the self-test

Use *Newton’s Telecom Dictionary* to look up any words you do not understand or that you want to understand better. “*Newton’s*” is an industry-standard reference book that you will want to keep handy.

Proceed at your own pace. The study and self-test questions for each chapter will help you determine how well you are absorbing the material. Use these questions as “open book” exercises. If you aren’t sure about an answer, go back to *How the Internet Works* or look up terms in *Newton’s* until you are sure. An answer key is in the back of this Study Guide.

References

The Study Guide section for each chapter includes references. These are addresses for Web sites that will help you learn more. For some chapters, pages on the MULTACOM site are suggested. Be sure to visit them, both to see an example of what has been described in the book and to become more familiar with MULTACOM's own Web site.

Other reference Web sites are directories of information on the subject of that particular chapter, or tutorials, or sites maintained by organizations that set standards or promote the study of Internet-related subjects. Using the Internet to learn about the Internet makes good sense and will take you as far as you care to go into anything that catches your interest.

Your Final

You will be tested on this material. Not in the traditional sense of answering a bunch of written questions, but by how well you do at MULTACOM. As a MULTACOM employee, customers and colleagues will simply expect you to know this information.

How well you learn it—and more importantly, how well you put it to use—will determine how far you go within MULTACOM and how far MULTACOM goes within our industry. So learning this material is much more important than preparing for a written test, learning this material will help you prepare for success.

Pacificraft Case Study

To help put the book's information into context, appropriate chapters of the study guide will refer to a fictitious MULTACOM customer called Pacificraft Yachts.

This company builds sailboats, which are built in the company's Los Angeles boatyard and sold nationwide. It relies on MULTACOM for:

- T1 connection at their Los Angeles headquarters
- Hosting of their Web site
- ISDN connection for a San Diego sales office
- DSL connection for a Miami sales office
- Dial-up connections for a sales representative working out of his house in Boston and for other company employees when they are on the road or working from home
- A VPN (Virtual Private Network) configured into an intranet that connects most or all of their offices, depending on the customer's needs.

1. The Wired World of the Internet

As the book implies, the Internet is somewhat like an international plumbing system through which data, rather than water, is constantly flowing. The following table builds on this analogy to show in gray the different Internet-related services that MULTACOM provides. Chapter 1 will help you learn the terms with which you are not already familiar:

Water system	Internet equivalent	MULTACOM involvement
Major aqueducts	Backbones	Owens a growing number of backbone circuits that make up the foundation of the public Internet
Municipal water system	Local and regional networks	Provides “private networks” that are separate from the Internet
Springs and rivers that supply water	Online Services and Web sites that provide content	Develops and hosts Web sites
Standards setting organizations	Organizations including the Internet Society and W3C	
Charters that define operating territories	Internet registrars working with InterNIC	Registers Web site names for customers through registrars
Contractors who hook buildings to the water system	Internet Service Providers (ISPs)	Both wholesales bandwidth to smaller ISPs and provides service directly to high bandwidth customers

Study Questions

- A. MULTACOM owns a growing network of backbones, one of which spans the US while another spans the Pacific Ocean. In order for these backbones to accept and transport both voice and data flowing through the Internet, they must comply with established Internet standards. What group would you contact to determine what these standards are?
- B. MULTACOM developed the Pacificraft Web site for them. Part of this service was registering their domain name: www.pacificraft.com. What type of business did MULTACOM contact in the process of registering this domain name?

References

Product information on MULTACOM Bandwidth Services:
<http://www.multacom.com/2000Site/ServiceAccess.htm>

Product information on MULTACOM VPNs:
<http://www.multacom.com/2000Site/ServiceSecuVPN.htm>

Information on InterNIC:
<http://rs.internic.net/index.html>

Self-Test Questions

1. Although no one entity actually “runs” the Internet, by agreeing to follow open standards, MULTACOM, along with other independently controlled businesses and organizations, provide different parts of the infrastructure that is collectively known as the Internet. How is this possible?
 - a) A federal agency sets Internet standards, which are then enforced by the World Wide Web Consortium (W3C).
 - b) Market forces decide which companies are providing the best technology and competitors are then forced to adopt those standards or lose business.
 - c) Organizations such as The Internet Society make technological and architectural recommendations that are voluntarily followed by all organizations providing Internet services.
 - d) Through a series of mergers and acquisitions, a few large companies have become so powerful that they have been able to effectively dictate the standards that smaller companies must follow.
2. The loose organization of networks that make up the Internet may be connected to Internet backbones by what means?
 - a) A single telephone line.
 - b) Fiber-optic cable with microwave links and satellite transmissions.
 - c) Cellular telephone circuits.
 - d) A and b but not c.

2. How Information Travels Across the Internet

Providing network services is a major aspect of MULTACOM's business. This area of our business has two main components:

- **Network provisioning**—this means creating and maintaining what the book calls regional networks, midlevel networks or wide area networks (WANs). They may also be referred to as virtual private networks (VPNs). These networks are typically created for the exclusive use of a specific enterprise or group.
- **Backbone services**—MULTACOM also provides what the book refers to as vBNS (very high-speed backbone services). They are available to anyone using the Internet, much like a toll road, which may be used by any vehicle willing to pay the appropriate toll. **Note** that in the vernacular of our industry the toll is based on “how wide of a lane” is used, somewhat like highway tolls are based on vehicle size.

One example of a VPN is the intranet used by Pacifircraft. This VPN provides communications among all Pacifircraft offices. One advantage to this is that only one connection to the Internet is required for the entire network, which is provided by a device called a gateway (described in the book). All data traffic (such as email) going between any computer on the Pacifircraft VPN and the Internet passes through this single gateway.

One of the most important backbones owned by MULTACOM is the link going from Los Angeles to Taipei. A network access point (described in the book) on either end operates somewhat like a turnstile, accepting data traffic from anyone sending data traffic across the Pacific and determining the proper toll to charge.

This chapter will help you understand how many different networks and components are combined to create the seamless global network that we call the Internet. Keep in mind that most of these components are available through MULTACOM.

Study Questions

- A. What is the name of the piece of equipment that would be used by a MULTACOM backbone to ensure that email and other data being transported is directed to the appropriate destinations?
- B. Sailboats, obviously, have no access to high-bandwidth phone lines when they are out of port. What can be done to provide high-speed access to this type of remote location?
- C. Using the 16th edition of Newton's Telecom Dictionary look up and be prepared to talk about the definitions of VPN and WAN.

Self-Test Questions

3. The services provided by MULTACOM include leased line bandwidth in several "sizes" including T3, T1, DSL and 56Kbps lines. These are examples of what type of service:
 - a) Ethernet networks
 - b) Internet access
 - c) Regional networks
 - d) Network access points
4. MULTACOM is able to provide bandwidth in such high volume that many of our customers are Internet service providers (ISPs) who "resell" our bandwidth in smaller quantities to their customers. Of the following, what service would typically not be offered by an ISP reselling bandwidth provided by MULTACOM?
 - a) T1 access
 - b) 56Kbps access
 - c) vBNS backbone service
 - d) Modem access

References

MULTACOM backbone maps:

<http://www.multacom.com/2000Site/Network.htm#>

3.

How TCP/IP Works

All services provided by MULTACOM conform to the TCP/IP standards that are explained in the book. This means that the ones and zeros that make up a digital transmission (such as an email or a Web page) are grouped into packets of ones and zeros (a single email or Web page may be broken up into dozens of packets).

These packets then travel over the Internet, similar to the way in which packages are shipped. This means that a packet seldom goes straight to its destination. Instead, it is handed off from router to router, much like a package may be handed off by the driver of a local truck to the driver of a long-haul semi-truck to the local delivery service.

This chapter will help you understand how the digital circuits that make up the Internet are fundamentally different from the circuits that make up the voice telephone system. Although voice can now be sent over the Internet ([Chapter 21, Making Phone Calls Over the Internet](#)), that is still in the development stage and the voice network remains largely separate from the digital networks that make up the Internet. It is digital backbones and networks that MULTACOM provides.

Study Questions

- A. A major advantage of MULTACOM owning long distance backbone circuits is that the IP packets we transport for customers make fewer hops in route to their destinations. And fewer hops mean fewer opportunities for delays or errors. For the inevitable errors that do occur, what information is carried in a packet header that helps to identify corrupted or missing packets?
- B. What does a circuit-switched network (used for traditional voice telephone calls) do that packet-switched circuits do not?

Self-Test Questions

5. Which of the following would not be included in the header information of an IP packet?
 - a) Phone number used for obtaining dial-up access
 - b) Order in which the packets should be assembled at their destination
 - c) Checksum
 - d) Destination address
6. SLIP and PPP are used when connecting to the Internet using what device?
 - a) Router
 - b) Winsock
 - c) Dial-up modem
 - d) DSL modem

7. If packetized voice over Internet protocol calls were using 12kb of bandwidth how many calls could you fit into the 128 kb of bandwidth a typical continuous-connection voice call uses?
 - a) 19
 - b) 100
 - c) 10
 - d) You can't do this

References

To take an online tour of MULTACOM facilities:

<http://www.multacom.com/2000Site/Facility.htm#>