专业认证考试丛书

CCNA 2.0考试指南

英文原版

All-in-One CCNA 2.0 Exam Guide

考试号：#640-507

■ [美] Robert E. Larson 著

OSBORNE McGraw Hill

電子工業出版社
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内 容 简 介

本书是美国著名的出版商McGraw-Hill出版的畅销认证系列丛书All-in-One中的一本。作者是著名的网络技术培训专家，他在本书中提供了极具洞察力的专家经验。本书的每一章都以考试目标开始，提供了考试技巧、章末的练习题以及大量的图表，可以帮助读者轻松通过CCNA 2.0考试（640-507）。本书主要讲述了以下方面的内容：OSI模型和网络拓扑结构，以太网、令牌环网和FDDI访问方法，第2层设备，网络协议，IP编址和子网化，路由协议，路由配置和IOS备份与恢复，Novell Netware IPX路由，访问控制表，LAN交换、VLAN和STP，WAN封装方法等；光盘中包含大量原汁原味的考试试题、练习考试、录像片断以及有用的工具和Internet考试资料。本书适用于Cisco职业认证考试的备考者及计算机网络技术人员。

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DEDICATION

This book is dedicated to my CCNA students,
past and present, who have challenged me,
supported me, and brought much joy to my
life through their many successes.

ACKNOWLEDGMENTS

A book project of this size is always the culmination of many people's efforts, energies, and insights. It would be impossible to take credit for what is really a group effort.

To Paulden Rodriguez, CCNP, who is one of the most intelligent and articulate young minds in networking today—thank you. You helped me when I needed it most. Paulden wrote Chapter 11 and the WAN chapters.

To Salvatore Collora, CCIE, my technical editor—thank you for trying to keep me honest. Sal comes from the world of the huge-budget networks in California, and he continually pushed me to include latest technology and concepts.

To John Read, Michael Sprague, and Gareth Hancock at Osborne/McGraw-Hill — thank you for making this project available to me. To Neil J. Salkind, my agent at Studio B — thank you for helping me put this project together.

To the many Osborne/McGraw-Hill people, such as Jessica Wilson and Jennifer Malnick-thank you for your many helpful words and kindnesses along the way.

To my friend and traveling partner Dave Warner — it's past time to head to Texas to reacquaint ourselves with the river walk, beaches, border towns, and the most beautiful people in the world. I want to spend some time where " getting connected" means lining up a ride to hear Willie or any of the great Texas bands.

To my students, fellow instructors, my friend and peer Scott Wolfe, my parents, and most of all my wife and kids, all of whom I have neglected these past months — thank you for your patience, support, and interest.

-Bob Larson

ABOUT THE CONTRIBUTORS

Bob Larson lives in the Puget Sound area, 25 miles southeast of Seattle, with his wife, Jerri. Just as the four adult children, Brett, Chris, Jared, and Jade, move on to careers and lives of their own, the next generation, Iris Mae, keeps things from ever becoming truly peaceful.

On May 18, 1980, when Mt. St. Helen's volcanic eruption trapped him in his house for ten days with a brand-new computer, Bob decided to change careers. Over the next couple years, he went to grad school and started teaching computer applications. Since 1985, he's done nothing else. Bob Larson & Associates provides course development as well as networking and applications training. Bob provides network consulting through Lighthouse Consulting, Inc., owned by his son Brett. Since 1997, Bob has been involved with the Cisco Networking Academy Program at two area community colleges, offering both CCNA and CCNP training.

Bob has been fortunate to be able to provide training in 20 states and four countries. He was selected to teach the first Cisco Academy CCNA program on the African continent in 1999, graduating 18 top-flight CCNAs who are now making their mark in the new South Africa. He is hoping to have a reunion visit in Summer 2001.

Technical editor **Salvatore Collora** is a Systems Engineer for Cisco Systems. He holds a CCIE in Routing and Switching, and is currently involved in pre-sales engineering efforts in Los Angeles. He has designed several large networks for various enterprise customers including the Staples Center, the *Los Angeles Times*, and Children' s Hospital Los Angeles. Prior to coming to Cisco, he was a weekly editorial contributor to *PC Week* magazine, and did systems design and support for Sony Pictures Imageworks.

Sal holds a Bachelors of Business Administration from Loyola Marymount University, and got his start in networking while on staff there. As he transitioned from LMU to Rubin Postaer and Associates in 1995 to bring Honda's first Web presence to fruition, he co-authored *Using Microsoft Exchange Server*, his first published work.

INTRODUCTION

Welcome to *CCNA All-in-One Certification Exam Guide*. This book is here to help you prepare to take—and pass—Cisco Certification Exam 640-507, titled "Cisco Certified Network Associate," or CCNA. Even more important, it is here to share a pool of knowledge that should make you employable in the field. If you strive for knowledge and experience, the certification will come. In this section, we will discuss skill building and exam preparation alternatives, the certification exam situation itself, Cisco's certification programs in general, and how this book can help you prepare for Cisco's certification exams. We will look at the following:

- Things to do to prepare
- CCNA exam insights
- Cisco Certification Information

Things to Do to Prepare

I cannot emphasize enough how important it is to get some hands-on experience with Cisco routers and switches. The exam asks many questions involving the Cisco IOS command syntax and the proper mode for executing those commands. Experience configuring devices is the best way to become comfortable with the Cisco IOS features. I have tried to include enough screen captures to assist you if hands-on experience is not possible.

Unlike some other certification, memorizing a long list of facts is not necessarily the best approach for Cisco exams. You must be able to apply the information and see it from other perspectives. The following sections are a list of resources that can help you study and prepare.

What Is in This Book

Preparing for any Cisco certification exam (including the CCNA) requires you to obtain and study materials designed to provide comprehensive information about the subject matter that will appear on your specific exam. This book contains more than enough information to pass the exam. The task now is to apply and absorb that information and become comfortable with it. This will present different levels of challenges based on your experience with networking. Obviously, someone who has been working in the field for a period of time will have a base of knowledge and skills that they can build on. I think this book can be a good tool for that person.

The other type of CCNA student I find where I teach is the person interested in getting into the IT field but has little or no real network experience, maybe even limited computer experience. I have tried to write this book for that person—the student who may need some background material, who may need to look at things from two or more perspectives, the one who is willing to work and study but doesn't know what needs to be done. Note that I refer to networking experience, not computer experience. They are not the same thing.

Classroom Training

Whether you use this book or not, classroom training for many people is the preferred way to learn

complex technologies. In this field, classroom training should be combined with hands-on experience with real routers and switches. There are several possible courses to follow:

Cisco Networking Academies I believe in this program for the average person. Since 1987, Cisco Systems has set up Networking Academies in more than 6,400 locations around the world. Half are in high schools and the rest are primarily in community colleges and trade schools. A few are at universities and at service organizations. This highly developed multimedia curriculum combined with abundant hands-on experience offered part-time over a seven-month period can create a solid foundation. The academies offer CCNA and CCNP training and are now branching out to include non-Cisco technologies like UNIX and Web design. To learn more about the Academy Program or to locate one in your area, check the following Web site: **www.cisco.com/warp/public/779/edu/academy/.**

Cisco Training Partners In larger cities, for the working administrator with solid foundation skills who truly meets the course prerequisites, these short, often five-day courses can be a quick way to fill in the gaps, gain limited hands-on experience, and move on to certification. I really like these programs for working professionals with a lot of experience. For them, this type of training can be an excellent value. On the other hand, if a person doesn't fit the target audience and can't keep up with the class, this can be a very expensive reality check. For more information, go to **www.cisco.com/** and click on the Training/Certification link.

Buying Equipment

Many students do particularly well if their long-term goal is CCNP or CCIE. Cisco vendors like Blackbox and **www.cdw.com** offer catalogs and knowledgeable support people. I have always had very good luck with eBay (**www.ebay.com**). Do a search on "Cisco" at the eBay site and there will be hundreds and some days thousands of items. The key is that you can't be in a hurry: Watch for the deal that you want and be ready to walk away.

There are two ways to use eBay. First, look at the people offering items. Many have Web sites linked to their auctions. See what kind of businesses they are and what other "deals" they have going. Second, if I'm buying a bigger item, I only buy from an auction that will take a credit card. I then use a card that guarantees my purchases. I've bought dozens of items and I don't feel that I've ever been hurt. I've never had an item fail to be delivered pretty much as advertised.

Virtual Labs and Simulators

One way to get a form of hands-on experience is through the use of router simulators or virtual labs. Some labs are real equipment scheduled for your use during a time period at an hourly rate. This method can be pretty expensive on a per-hour basis but a very good value when compared to the thousands of dollars it would take set up a similar lab. Other virtual labs are lab simulators that exist only in your computer or out on the Web. A Web site you might want to start with is **www.routersim.com.**

Practice Exams

I hate the thought of a person taking a test repeatedly until he knows enough of the questions to pass. This leads to what the industry refers to as "paper certifications" or, worse yet, "vapor certifications." It is bad for the industry and can't be all that great for the individual. What value is the certification if you get fired from the job because you can't do the work?

Having said that, I do believe in taking practice tests once you have trained and prepared yourself. This serves two purposes: First, it may point out gaps or weaknesses in your training plan; second, and more important, it helps to prepare you for the exam itself. Particularly for those students that have been

out of school for a few years, the exam process can be a shock. Having gone through the MCSE, CCNA, and CCNP program plus many of the second-tier certifications out there, I suspect that Cisco exams are like none you've taken before. While they are fair and valid, they are not designed to pass a lot of students. They are designed to see if you know the exam material forward and backward. My students have found the exams at **www.boson.com** are both challenging and helpful.

Cram Sessions and Brain Dumps

There are Web sites called brain dumps, where test takers try to list as many test questions as they can remember. First, these are a waste of time and energy. Second, they violate the non-disclosure agreement that every test taker agrees to when they take the exam. In the end, you compromise your integrity for a bit of short-term memory fodder.

What time I've spent at the sites that I'm aware of, I've found a mix of good and bad questions, questions from old exams, questions from the wrong exams, and a small amount of mischief. There are better ways.

One site I like is **http://cramsession.brainbuzz.com/.** They have a series of study guides—usually 12 to 20 pages—for many exams that I recommend to all of my students. Although they do not give you questions, they give you lists of things to know. But this doesn't replace studying. The practice that I follow, and I recommend to my students, is that each night for the week before a scheduled exam, I read the Cram session just before bed. Typically, it will lead me to question some points and after researching, I put the results on the margins of the study guide. Their study guide is the only thing that I ever take to a test site. I try to review it once before going into the test site.

Do you need all of the things covered in this section? Probably not. But I've tried to offer a mix to helpful tools and suggestions.

CCNA Exam Insights

Once you have prepared for your exam, you need to register with a testing center. The computer-based CCNA exam costs $100 (North America), and if you don't pass, you may retest for an additional $100 each time. In the United States and Canada, tests are administered by Prometric Testing Centers.

You can sign up for a test through Prometric's Web site at **www.2test.com**, or you can register by phone at (800) 204-EXAM (within the United States or Canada). The Web site will not allow you to schedule exams within 48 hours, so use the phone registration for shorter scheduling intervals. It is often possible to take tests the same day. Be prepared to wait through voice messages.

To sign up for a test, you will need a valid credit card.

To schedule an exam, call the toll-free number or visit the Web page at least one day in advance. Before booking the exam, make sure that you understand the cancellation process and deadlines, currently before 7:00 p.m. Central Standard Time the day before the scheduled test time (or you will be charged, even if you don't appear to take the test).

When you want to schedule a test, have the following information ready:

- **Exam number (640-507) and title (CCNA)**
- **Your name** Exactly the way that you want it to appear on your certificate
- **Your social security, social insurance, or Prometric number (SP)**
- **A method of payment** Credit card
- **Contact telephone numbers** In case of a problem so they can reach you
- **Mailing address** Where you want your certificate mailed

• **E-mail address** For contact purposes, you will get an e-mail confirmation

Once you sign up for a test, you will be informed as to when and where the test is scheduled. Try to arrive at least 15 minutes early—I tell students to show up an hour early, just in case. You can always relax and review your notes. I've sat in exams next to students who have showed up late for whatever reason. They seem miserable, and I suspect the stress and tension is reflected in the score.

Photo ID

You will need to bring two forms of identification to the testing site. One form must be a photo ID, such as a driver's license or a valid passport. The other must have a signature. The test cannot be taken without the proper identification.

Gum, Candy, and Cough Drops

Do yourself a favor and bring something with you. It can always just sit there ignored, but the last thing you want is a dry throat or coughing fit to disrupt your testing and the silence for your peers.

The Exam Process

When you show up at the testing center, you will need to sign in with an exam coordinator. They will ask you to show the two forms of signature identification. After you have signed in and your time slot arrives, you will be asked to deposit any items with you, such as books, bags, pagers, or calculators. Make sure that you know where the restrooms and drinking fountain are located. You will be escorted into a closed room.

All exams are closed-book. You will be furnished with one or two blank sheets of paper and a pen, or, in some cases, an erasable plastic sheet and an erasable pen. Before the exam, you should memorize as much of the important material as you can, so you can write that information on the blank sheet as soon as you are seated in front of the computer, before you start your exam. You can refer to this piece of paper any time you like during the test, but you will have to turn it in when you leave.

You will have some time to compose yourself, to record this information, and to take a sample orientation exam before you begin the real test. You will also be required to complete a computer-based survey to track demographics of the test candidates. Typically, if an exam has a 75-minute time limit, you will have 90 minutes to take the sample exam, complete the survey, and take the actual exam. Once you start the actual exam, you now have only the exam time limit. If this is your first Cisco exam, I suggest that you take the orientation test before taking your first exam.

Typically, the room will have up to a dozen computers. Each workstation will be separated from the others by dividers designed to keep you from seeing your neighbor's computer. Keep in mind that the people next to you could be taking a certification exam from an industry totally unrelated to yours, so don't be concerned if someone starts after you or finishes before you. Most test rooms use closed-circuit cameras. This permits the exam coordinator to monitor the room.

The exam coordinator will have preloaded the appropriate Cisco certification exam, which for this book is Exam 640-507. If there is a problem with the exam—such as the version number, the screen doesn't display all data, and so on—let the coordinator know right away. Do not put yourself at a disadvantage. You can start as soon as you are seated in front of the computer. I suggest that you sit back for a minute and relax. Take a deep breath. If the chair is adjustable, adjust it. Move your arms and legs to release any tension. You are going to be sitting there almost 90 minutes.

All Cisco certification exams allow a certain maximum amount of time in which to complete the

work (this time is indicated on the exam by an on-screen counter/clock, so you can check the time remaining whenever you like). All Cisco certification exams are computer-generated and most use a multiple-choice format, often with six to eight choices. It is possible, if not likely, that several questions will refer to an exhibit containing dozens of commands from which you will be expected to select one as the answer to a specific question.

Although this may sound quite simple, the questions are not only constructed to check your mastery of basic facts and skills about the subject material, but they also require you to evaluate one or more sets of circumstances or requirements. Often, you are asked to give more than one answer to a question, although you will always be told how many to choose. *You get only one pass through the questions.* You cannot mark a question and return to it later.

When you complete the Cisco certification exam, the exam will tell you whether you have passed or failed. All test objectives are broken into several topic areas and each area is scored on a basis of 100 percent. Particularly if you do not pass the exam, select the option on the screen that asks if you want to print the report. The test administrator will print it for you. You can use this report to help you prepare for a second effort, if needed. Once you see your score, you have the option of printing additional copies of the score report. It is a good idea to print it twice.

Remember, if you need to retake an exam, you will have to schedule a new test with Prometric and pay another $100.

Exam Design

All Cisco tests use one of five basic question types:

- Multiple-choice with a single answer
- Multiple-choice with two or more answers (the question will indicate how many answers)
- Multipart with one or more answers (the question will indicate how many answers)
- CLI-based questions (many times, an exhibit will present a sample IOS configuration in which you are asked to choose the correct command or interpret the configuration's output, per the question's directions)
- A different format, such as fill in the blank, ordering, or matching

Take the time to read a question at least twice before selecting an answer, and pay special attention to words such as "not" that can radically change the question. If a question seems very simple, great—but read it over once more to make sure that you aren't missing something.

Always look for an Exhibit button as you examine each question. The Exhibit button brings up graphics used to help explain a question, provide additional data, or illustrate network design or program behavior.

NOTE: Before scheduling your test, make sure you understand the Windows interface—maximizing, restoring, moving, resizing, and tiling windows.

Cisco exams do not allow you to return to questions, so you must make sure to answer the question as best you can before proceeding to the next one. The exam will clearly state before you start whether you can mark answers and return.

Cisco's Testing Format

All Cisco exams are fixed-length with a fixed number of questions. Each candidate will get the same

number of questions; the order of the questions can vary, as can the specific questions. If you retake an exam, assume there will be different questions. From time to time, questions are replaced and others may not be scored.

Cisco provides a counter in the upper-right corner (near the remaining time) showing the number of questions completed and the number outstanding. Monitor your time to make sure that you have completed at least one-quarter of the questions one-quarter of the way through the exam period and three-quarters of the questions three-quarters of the way through. Have the calculations done in advance, such as 16 questions by 18 minutes.

If you are not finished with ten minutes remaining, try to pick up the pace. When there are five minutes remaining, use the remaining time to guess your way through any remaining questions. Guessing is better than not answering—blank answers are always wrong, but a guess may turn out to be right. The important thing is to answer every question.

Some Basic Question-Handling Strategies

For those questions that take only a single answer, usually two or three of the answers will be obviously incorrect, and a couple of the answers will be plausible. Of course, only one can be correct. Unless the answer leaps out at you, begin the process of eliminating those answers that are most obviously wrong.

Many questions assume that the default behavior of a particular command or option is in effect. If you know the defaults and understand what they mean, this will help you with your choice.

Cisco exams are generally pretty straightforward and not intended to beat you out of your certification; but, then again, they are not designed to be easy. Pay attention, particularly with syntax. Knowing the difference between *access-list 1 deny any* and *access list 1 deny any* should be assumed (note the hyphen).

If the answer seems immediately obvious, reread the question to look for a trap; sometimes those are the ones you are most likely to get wrong.

Typically, at least one answer out of the possible choices for a question can be eliminated immediately because the answer does not apply to the situation or the answer describes a nonexistent issue or option.

If faced with guessing among two or more potentially correct answers, reread the question. Try to picture how each of the possible remaining answers would alter the situation. Be especially sensitive to terminology; sometimes the choice of words (such as "remove" instead of "disable") can make the difference between a right answer and a wrong one.

Cisco Certification Program

The Cisco Certification Program currently includes the following separate certificates with various specialty tracks. You should become familiar with and visit Cisco's Web site at **www.cisco.com/go/certifications/.**

The number of questions and time limits for the following exams were accurate at the time this book was written. Cisco reserves the right to change either as it sees fit. Cisco tries to keep this information confidential, although you can check either figure when you register for an exam.

The major certifications are:

CCNA (Cisco Certified Networking Associate)

Exam 640-507 is a 65-question, 75-minute exam. The cost is $100. The CCNA certification

demonstrates the ability to install, configure, and operate simple-routed *local area network* (LAN), routed *wide area network* (WAN), and switched LAN. Topics include: Ethernet, Token-Ring, TCP/IP, IPX/SPX, IP RIP, IGRP, IPX RIP, access lists (ACLs), LAN switches, VLANs, Serial Communications, ISDN, Frame-Relay, and Point-to-Point Protocol (PPP).

The CCNA certification provides a foundation for pursuing advanced Cisco certifications. It is a prerequisite for the Cisco Certified Network Professional (CCNP) and Cisco Certified Design Professional (CCDP), and is suggested for the Cisco Certified Internetwork Expert (CCIE). The CCNA certification covers concepts and skills vital to the operation of modern computer networks, and would be valuable to network administrators, network engineers, and students preparing for these roles.

CCDA (Cisco Certified Design Associate)

Exam 640-441 is a 72-question, 120-minute exam. The cost is $100. The Cisco Network Design Career certification track is designed for people who want to design Cisco-based networks that predominantly include routed LAN, routed WAN, and switched LAN networks.

CCNP (Cisco Certified Networking Professional)

CCNP is a comprehensive internetworking skills certification that requires successfully passing four exams. Each exam is approximately 65 questions in 75 minutes. The cost of each exam is $100. The number of questions and time limit for each should be confirmed by checking with your testing center or by calling Prometric. The four exams are:

- **BSCN (Building Scalable Cisco Networks)** Exam 640-503
- **BCMSN (Building Cisco Multilayer Switching Networks)** Exam 640-504
- **BCRAN (Building Cisco Remote Access Networks)** Exam 640-505
- **CIT (Cisco Internetwork Troubleshooting)** Exam 640-506

CCDP (Cisco Certified Design Professional)

CCDP is a comprehensive internetworking design skills certification that requires successfully passing four exams. Each exam is approximately 65 questions in 75 minutes. The cost of each exam is $100. The number of questions and time limit for each should be confirmed by checking with your testing center or by calling Prometric. The four exams are:

- **BSCN (Building Scalable Cisco Networks)** Exam 640-503
- **BCMSN (Building Cisco Multilayer Switching Networks)** Exam 640-504
- **BCRAN (Building Cisco Remote Access Networks)** Exam 640-505
- **CID (Cisco Internetwork Design)** Exam 640-025

CCIE (Cisco Certified Internetwork Expert)

The CCIE certification is possibly the most influential in the internetworking industry today. It is famous (or infamous) for its difficulty and for how easily it holds its seekers at bay. The certification requires only one written exam (350-001); passing that exam qualifies you to schedule time at a Cisco campus to demonstrate your knowledge in a two-day practical laboratory setting. You must pass this lab

with a score of at least 80 percent to become a CCIE. Recent statistics have put the passing rates at roughly 20 percent for first attempts and 35 to 50 percent overall. Once you achieve CCIE certification, you must recertify every two years by passing a written exam administered by Cisco.

Receiving Your Certificate

After passing the necessary certification exam(s) and agreeing to Cisco's nondisclosure terms, you will be certified. Official certification normally takes four to six weeks. The package includes a welcome kit that contains a number of elements:

- Official certificate (suitable for framing)
- A laminated wallet card
- A graduation letter
- A license to use the Cisco certification logo, in advertisements, promotions, documents, resumes, letterhead, business cards, and more
- Access to the online Tracking System

Tracking Cisco Certification Status

As soon as you pass any Cisco exam, you must complete a certification agreement. To do this, go to Cisco's Web site (**www.cisco.com/go/certifications/**) and select the Tracking System link, or go directly to the Certification Tracking Web site (**www.galton.com/~cisco/**). You can also mail a hard copy of the agreement to Cisco's certification authority. You will not be certified until you complete a certification agreement and Cisco receives it in one of these forms.

The Certification Tracking Web site also allows you to view your certification information. Cisco will contact you via e-mail and explain your certification and its use.

Recertification

Cisco requires three-year recertification for the non-CCIE programs. The best place to keep tabs on the Cisco Career Certifications program and its related requirements is on the Web, at **www.cisco.com/go/certifications/.**

About This Book

CCNA All-In-One Certification Exam Guide can provide you with the knowledge you need to study and prepare for CCNA Exam 640-507.

Cisco routers, LAN switches, firewalls, ATM switches, and so on, are at the heart of many of the world's networks, both large and small. The skills developed for this exam will help to make you a more useful and marketable member of the industry. If you know how to configure the de facto industry standard devices, then employers will know that you can work with any other technology—or learn the skills necessary to do so.

When you complete your CCNA, you will be at the threshold of a world of opportunities in the IT field. These opportunities are only limited by your ability to dream and then to act. Take the time while you are learning to see the opportunities in the field. Several of the people working for me wouldn't have bet they would be teaching a year or two ago. This is a rapidly advancing industry that offers ample opportunity for personal growth and for making a contribution to your business or organization. This book will provide the knowledge that you need today plus a sound basis for understanding the

changes that you will encounter in the future. It also is intended to give you the hands-on skills you need to be a valued professional in your organization.

Without a doubt, this has been the best opportunity for people to make substantial changes in their lives. Most students are employed as they finish their training, move into other positions, or take positions with other companies.

What I have noticed is that although there are successes at every level, the ones who really seem to succeed are the ones that really apply themselves to learning their craft. They are the ones who use extra time to get more hands-on experience. If you have little or no experience, that doesn't have to remain a barrier. One of our greatest successes was stocking shelves at a Home Depot when he started CCNA training. Nine months later, he was moving halfway across the country for a new job and he has been on the fast track since—I imagine he will have his CCIE by the time you read this.

This is an exciting field with limitless opportunities for those who want to make the effort, take the setbacks (they happen too), and do the things necessary to prepare themself for the IT industry. Just reading this book won't do it all for you. It will help you develop your knowledge, but you need to do those things that will help you gather experience. Part of that is talking to people. Talk to anybody who will listen. Make sure they know what you are doing and why. Let them see that you are serious about this. You will be amazed where opportunities come from.

Let's get started!

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