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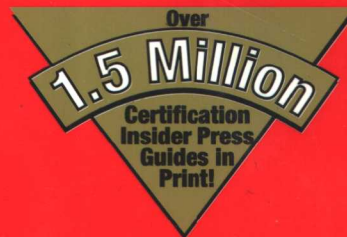
Advanced Cisco Router Configuration

Exam 640-403

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CCNP Advanced Cisco Router Configuration

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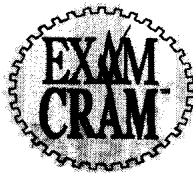
CCNP Advanced Cisco Router Configuration

The Cram Sheet

This Cram Sheet contains the distilled, key facts about CCNP Advanced Cisco Router Configuration. Review this information last thing before you enter the test room, paying special attention to those areas where you feel you need the most review. You can transfer any of these facts onto a blank sheet of paper before beginning the exam.

SCALABLE INTERNETWORKS

1. Router Roles:
   - Core—At the top of your internetwork hierarchy.
   - Distribution—In the mid-sections of your hierarchy providing connectivity from the core backbone to the individual sites.
   - Access—At the bottom of the hierarchy providing end user access to internetwork resources.
2. Compression is best-utilized on low speed serial links.

TRAFFIC MANAGEMENT

3. IP standard access-lists:
   - Filter only on source IP address.
   - Use list numbers between 1 and 99.
4. IP extended access-lists:
   - Filter on source IP address, destination IP address, protocol and port number.
   - Use list numbers between 100 and 199.
5. A wild card mask is the inverse value of a subnet mask. To find an appropriate wildcard mask for a specific subnet, change the binary value of each bit in the subnet mask. For example, a subnet mask of 255.255.255.240 would use a wildcard mask of 0.0.0.15.
6. IPX standard access-lists:
   - Filter in source and destination IPX address.
   - Use list numbers between 800 and 899.

7. IPX SAP access-lists:
   - Filter based on SAP type.
   - Use list numbers between 1000 and 1099.
8. Standard access-lists should be placed as close as possible to the destination of the filtered traffic.
9. Extended access-lists should be placed as close as possible to the source of the filtered traffic.
10. Any traffic not specifically permitted by an access-list is denied. The last line of all access-lists is an implicit deny.
11. A static route specifying an outbound interface of null 0 is a good alternative to access-lists.
12. The command **line vty 0 4** will change you to the virtual terminal configuration prompt.
13. IP helper addresses should be placed on the inbound interface that will be receiving the broadcast to be forwarded.
14. The command **ipx routing** will enable the forwarding of IPX traffic on your router.
15. Required information for tunnel configuration:
    - Tunnel Source—The outbound interface through which to depart this router.
    - Tunnel Destination—The next logical hop IP address where the tunnel terminates.
    - Tunnel Mode—The definition of the mode used to encapsulate the traffic to be carried (*tunnel mode gre-ip* is the command to set it to Generic Route Encapsulation).

- Encapsulated protocol attributes (such as IPX network number, AppleTalk, Cable-range, and Zone).

QUEUING

16. Queuing is best used on slower (T1 and below) Serial links that are subject to bursty traffic.

17. Weighted Fair Queuing:
    - Low volume traffic gets priority on outbound interface.
    - On by default on Serial interfaces 2Mbps and below.

18. Priority Queuing:
    - Four queues—High, Medium, Normal and Low
    - Assign various traffic types to queue using priority-list command (for example, **Priority-list 1 protocol ipx medium** will place all outbound IPX traffic into the medium queue).
    - **show queuing priority** will display the current priority queuing configuration.

19. Custom Queuing:
    - All queues processed in round-robin fashion.
    - There are 17 queues, 0 through 16. 0 is for system traffic and is not configurable. 1 through 16 are configurable queues.
    - **show queuing custom** displays custom queuing configuration.

ROUTING PROTOCOL OVERVIEW

20. Routing Protocol Metrics:
    - OSPF—Cost (based on bandwidth)
    - EIGRP—Bandwidth, delay, load, reliability, and MTU

21. Administrative Distance—The believability of a route learned by a particular routing protocol:
    - OSPF—110
    - EIGRP—90
    - Static Route—0 or 1 (depends on configuration. see next item)
    - Use the **distance** command to manipulate administrative distance from the config-router prompt.

ADVANCED IP ADDRESSING

22. IP Addressing:
    - Routing decision based on longest match of routing table entry to destination address.
    - Class A—1 to 126
    - Class B—128 to 191
    - Class C—192 to 223
    - To find number of subnets created or number of hosts per subnet use 2^x-2 formula.
    - Subnet address derived through *logical AND* process.

23. Private Internetwork Space:
    - Class A—10.0.0.0 to 10.255.255.255
    - Class B—172.16.0.0 to 172.31.255.255
    - Class C—192.168.0.0 to 192.168.255.255

24. VLSM
    - Routing protocol must be capable of passing the prefix in routing updates to support VLSM.
    - RIP and IGRP do not support VLSM.
    - OSPF does support VLSM.
    - EIGRP support for VLSM must be enabled (*no auto-summary* under the EIGRP configuration).
    - Further subdivide the address space.
    - Mask for Serial links is 255.255.255.252 to provide for only two hosts.

25. Route summarization:
    - Find a common bit boundary in the sequence of network addresses.
    - Count the number of bits the addresses have in common to create the prefix.
    - Use the command *area* <**number**> *range* <**network address**> <**prefix**> for OSPF route summarization. This command is entered under the OSPF configuration.
    - Use the command *ip summary-address eigrp* <**as number**> <**network address**> <**prefix**> for EIGRP route summarization. This command is entered on the outbound interface that will be advertising the summary route. Enter the command **no auto-summary** under the EIGRP to support summarization.

26. Network Address Translation (NAT) is used to convert private internal IP addresses to public external IP addresses, which should exist in your registered space.

OSPF

27. OSPF is a link state routing protocol.

28. Developed to overcome RIP limits:
    - Fast convergence
    - No hop count limit
    - Support for VLSM
    - Metric is cost based on bandwidth
    - Efficient routing updates via multicast

29. Uses Hello protocol to establish neighbor relationship.

30. DR election:
    - Highest priority is DR
    - Second highest priority is BDR
    - Router ID used to break tie on priority.
    - Router ID is highest IP address or IP address of Loopback 0 interface.

- Election of DR/BDR will only occur on broadcast media (such as Ethernet and Token Ring).

31. Routing Updates:
    - Routing updates sent to DR and BDR if present via 224.0.0.6.
    - DR forwards routing updates to other OSPF routers via 224.0.0.5.
    - If no DR/BDR, simply forward update to neighbor(s).
    - Routing updates are called LSAs are disseminated in flooding fashion.

32. Required Information for OSPF neighbors:
    - Neighbor ID
    - Area ID
    - Router Priority
    - DR IP Address
    - BDR IP Address
    - Authentication Type
    - Authentication Password
    - Stub Area Flag

33. OSPF Router Designations:
    - Internal Router—Any router with all interfaces in one area.
    - Area Border Router—Any router with interfaces in multiple areas.
    - Backbone Router—Any router with an interface in area 0.
    - Autonomous System Boundary Router—Any router with a connection to an external autonomous system.

34. Stub Areas:
    - Stub area—Contains only one exit point (via the ABR to area 0), all intra-area routes, summary routes to other areas and a default route.
    - Totally Stubby Area—Contains only one exit point (via the ABR to area 0), all intra-area routes and a default route. It contains no external routes.
    - All routers in stub or totally stubby area must agree that the area is a stub.
    - Use the *area* **<number> stub no-summary** command on the ABR to create totally stubby area.
    - Use the area <number> stub on internal routers to tell them they're part of a stub area.
    - Do not stub area 0.

35. Virtual links must be configured on areas that cannot connect directly to area 0.

36. Show commands:
    - **show ip protocols**—Show active routing protocols
    - **show ip ospf neighbors**—Show neighbor database

EIGRP

37. Routes for IP, IPX, and AppleTalk.

38. Metric is composite of bandwidth, delay, load, reliability and MTU.

39. Best route is called successor or current successor. Selected based on lowest feasible distance.

40. Second best route is called feasible successor. Advertised distance of this route must be lower than feasible distance of best route to be considered a feasible successor.

41. Automatic redistribution between EIGRP and IGRP if AS numbers are same.

42. Use the *ip summary-address eigrp* **<as number>** **<network address> <prefix>** on the outbound interface to configure summarization.

43. Use the **ipx sap-incremental** command to force incremental RIP/SAP updates on a particular interface.

44. Show commands:
    - **show ip eigrp neighbors**—Displays the EIGRP ip neighbor table.
    - **show ip eigrp topology**—Displays the EIGRP ip topology table.
    - **show ip route**—Displays the ip routing table.

OPTIMIZING ROUTING UPDATES

45. Static routes:
    - ip route <dest.network> <dest. netmask> <next hop addr I out int> <distance>
    - Specifying outbound interface sets administrative distance to 0 and automatically redistributes.
    - Specifying next hop address sets administrative distance to 1 and requires manual redistribution.
    - Manipulating administrative distance to a high number so that the dynamic route will show and use the static route as a backup is called a floating static route.

46. Default Route:
    - Use the **ip default network <network address>** command to set on each router.

- Use ip route 0.0.0.0 0.0.0.0 <out int | next hop address> to set static default route.

47. Stopping Routing updates:
    - Use the **passive interface <int>** command to force a routing protocol to stop sending updates.
    - Use distribute lists with access-lists to filter routes.

CONNECTING TO AN ISP

48. Use BGP to connect to ISP when you need multiple exit points or when specified by ISP.

49. EBGP is a BGP connection to an external AS while IBGP is a BGP connection within the local AS.

50. Use a default route to point your AS to the ISP rather than redistributing.

NLSP

51. Novell's Link State replacement for the distance vector IPX RIP protocol.

52. Define ipx internal network number, area designation, and enable on each interface.

INTRODUCTION TO WANS

53. Possible encapsulations are HDLC, Frame Relay, ATM, SDLC, PPP, and SMDS.

54. Default encapsulation on Cisco serial interface is HDLC. All others must be configured.

ISDN INTERNETWORKING

55. Use PPP or HDLC encapsulation.

56. Can be native ISDN (TE1) or non-native ISDN (TE2). TE2 must connect to TA.

57. Required DDR information:
    - Set ISDN switch type at global config (**isdn switch-type <type>**).
    - Static route to destination network beyond ISDN link.
    - Define interesting traffic with dialer-list (can point to access-list if necessary).
    - Apply dialer list to interface as dialer-group.
    - Create a dialer-map to destination.

58. Optional PAP (clear text) or CHAP (encrypted) authentication with PPP.

59. PPP Multilink will bind two channels together as one link. *Dialer load-threshold <load>* tells router when to initialize second channel.

60. **Dialer idle-timeout <seconds>** tells router when to bring link back down when interesting traffic stops.

BRIDGING

61. Transparent bridging is unknown to end hosts.

62. Encapsulated bridging is the encapsulation of a bridged frame inside of a serial frame.

63. Source Route Bridging is a Token Ring implementation for routing frames from ring to bridge to ring.
    - Create Virtual Ring if more than two active SRB ports.
    - RIF tells route that traffic should take.
    - If RIF is present, first bit of source MAC address is set to 1 (so the hex value will be in range 8 – f).
    - RIF consists of Routing Control field and Route Descriptor Fields.

64. Source Route Transparent bridging is used when moving between Token Ring hosts that are transparent bridged and those that are Source route bridged. RIF is added and removed as needed.

65. Source Route Translational bridging is the translation of Ethernet frames to Token Ring frames and back.

66. Integrated Routing and Bridging allows passage of bridging traffic out of routed interfaces as well as the passage of routed traffic out of bridged interfaces via a logical Bridged Virtual Interface (BVI).

T1/E1 AND PRI OPTIONS

67. Configure integrated CSU/DSU (controller) with framing, line coding and clock source (all telco provided information).

68. Framing choices in North America are SF or ESF for T1 and Multiframe for E1.

69. Line Coding choices in North America are AMI and B8ZS for T1 and AMI and HDB3 for E1.

70. PRI uses same line coding and framing as T1. You must define switch type.

This book is dedicated to my wife Beth and my daughters Emma and Amanda for their patience in putting up with me during its production. Also included in this dedication is Michelle Smith. Her willingness to give a kid a chance so long ago made this possible.

—Brian Morgan

This book is dedicated to my wife Dianne whose love and support makes all things possible.

—Mike Shroyer

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About The Authors

Brian Morgan is a Certified Cisco Systems Instructor (CCSI) for GeoTrain Corporation, Cisco's first and largest Certified Training Partner. He has been teaching Cisco courses for over two years and has been involved in the networking world for 10 years. The Cisco courses he teaches include the Introduction to Cisco Router Configuration (ICRC), Advanced Cisco Router Configuration (ACRC), Cisco Campus ATM (CATM) and Cisco Voice Over Frame Relay, IP and ATM (CVOICE) courses.

Prior to teaching for GeoTrain, Brian spent a number of years with IBM in the Network Services division where he attained MCNE and MCSE certifications. He was involved in a number of larger LAN/WAN installations for many of IBM's largest clients including Bell Helicopter, Federal Reserve and Hallmark.

Today, Brian is GeoTrain's representative to the ATM Forum, a standards body reporting to the ITU for ATM Standards and Specifications. He is actively involved in the expansion of ATM as a technology.

Brian is the proud father of fraternal twin girls, Emma and Amanda (age 4) who keep him quite busy when he's at home.

Mike Shroyer is President of J.M. Shroyer Associates, Inc. (JMSAI) a 20-year old, Denver-based data communications consulting company. He has over 35 years experience at all levels in the computer field. Mike is a Cisco Certified Internet Expert (CCIE #2280) and Certified Computer Professional (CCP). As a Certified Cisco Systems Instructor (CCSI). Mike has worked as a contract instructor for GeoTrain, Inc. and its predecessor, Protocol Interface, Inc. for over five years. The Cisco courses he teaches or has taught include the Introduction to Cisco Router Configuration (ICRC), Advanced Cisco Router Configuration (ACRC), Cisco Campus ATM (CATM), Cisco Internetwork Design (CID) and Introduction to Cisco Works Configuration (ICWC).

Mike has lectured and consulted extensively in the United States, Europe and Asia on Internetworking, SNA, network security and audit of data networks, Unix, C language programming, and other technical topics. In addition to his consulting practice Mike has taught for the University of Denver in its Masters in Computer Science program and for Metropolitan State College.

Mike is married to Dianne and lives in Denver, Colorado.

Acknowledgments

Introduction

Welcome to the *CCNP Advanced Cisco Router Configuration Exam Cram*! This book aims to help you get ready to take—and pass— the Cisco career certification test numbered 640-403, "Advanced Cisco Router Configuration (ACRC)". This Introduction explains Cisco's certification programs in general and talks about how the *Exam Cram* series prepare for Cisco's career certification exams.

Exam Cram books help you understand and appreciate the subjects and materials you need to pass Cisco career certification exams. *Exam Crams* are aimed strictly at test preparation and review. They do not teach you everything you need to know about a topic (such as the ins and outs of managing a Cisco router implementation). Instead, we (the authors) present and dissect the questions and problems we've found that you're likely to encounter on a test. We've worked from Cisco's own training materials, preparation guides, and tests, and from a battery of third-party test preparation tools. Our aim is to bring together as much information as possible about Cisco certification exams.

Nevertheless, to completely prepare yourself for any Cisco test, we recommend that you begin your studies with some instructor-led classroom training. You should also pick up and read one of the many study guides available from Cisco or third-party vendors, including The Coriolis Group's *Exam Prep* series. We also strongly recommend that you install, configure, and fool around with the Internetwork Operating System (IOS) software or environment that you'll be tested on, because nothing beats hands-on experience and familiarity when it comes to understanding the questions you're likely to encounter on a certification test. Book learning is essential, but hands-on experience is the best teacher of all!

The Cisco Career Certification Program

The Cisco Career Certification Program is relatively new on the internetworking scene. The best place to keep tabs on it is the Cisco Training Web site, at www.cisco.com/training/. Before Cisco developed this program, Cisco Certified Internetworking Expert (CCIE) certification was the only available Cisco

certification. Although CCIE certification is still the most coveted and prestigious certification that Cisco offers (possibly the most prestigious in the internetworking industry), lower-level certifications are now available as stepping stones on the road to the CCIE. The Cisco career certification program includes four certifications in addition to the CCIE, each with its own new acronym. If you're a fan of alphabet soup after your name, you'll like this program:

➤ **Cisco Certified Network Associate (CCNA)** The CCNA is the first career certification. It consists of a single exam that covers information from the basic-level classes such as Introduction to Cisco Router Configuration (ICRC) and Cisco LAN Switch Configuration (CLSC). Cisco also offers a class aimed at the CCNA certification known as Cisco Routing and LAN Switching (CRLS). You must obtain CCNA certification before you can get any other Cisco certification.

➤ **Cisco Certified Design Associate (CCDA)** The CCDA is a basic certification aimed at designers of high-level internetworks. The CCDA consists of a single exam that covers information from both the Designing Cisco Networks (DCN) and the Cisco Internetwork Design (CID) course. You must get CCDA certification before you can move up to the CCDP certification (discussed shortly).

➤ **Cisco Certified Network Professional (CCNP)** The CCNP is a more advanced certification. It is not an easy certification to obtain. To earn CCNP status, you must be a CCNA in good standing, and you must pass two additional tests. The first is the Foundation Routing/Switching exam (number 640-409), which consists of information from the ACRC course (covered in this book), CLSC, and Configuring, Maintaining and Troubleshooting Dial-up (CMTD). If you're not up for a long test—this one takes from two to three hours—you can take each of the exams for these classes individually. The second test that you must pass to complete CCNP certification is the Cisco Internetwork Troubleshooting (CIT) exam.

Once you have completed the CCNP certification, you can further your career (not to mention beef up your resume) by branching out and passing one of the CCNP specialization exams. These include:

➤ Security (Managing Cisco Network Security—MCNS)

➤ LAN ATM (Campus Asynchronous Transfer Mode—CATM)

➤ Voice Access (Cisco Voice over Frame Relay, ATM and IP—CVOICE)

Table 1 Cisco CCNA, CCNP, And CCIE Requirements*

CCNA

Only 1 Exam Required	
Exam 640-407	CCNA (Cisco Certified Network Associate)

CCNP

All 5 of these are required	
Exam 640-407	CCNA (Cisco Certified Network Associate)
Exam 640-403	ACRC 11.3 (Advanced Cisco Router Configuration)
Exam 640-404	CLSC (Cisco LAN Switch Configuration)
Exam 640-405	CMTD (Configuring, Monitoring, and Troubleshooting Dial-up Services)
Exam 640-406	CIT (Cisco Internetwork Troubleshooting)

CCIE

1 Written Exam and 1 Lab Exam Required	
Exam 350-001	CCIE Routing and Switching Qualification
Lab Exam	CCIE Routing and Switching Laboratory

* This is not a complete listing. We have included only those tests needed for the Routing and Switching track.

➤ SNA Solutions (SNA for Multiprotocol Administrators—SNAM— and Data Link Switching plus—DLSW)

➤ Network Management (Managing Cisco Routed Internetworks— MCRI—and Managing Cisco Switched Internetworks—MCSI)

➤ **Cisco Certified Design Professional (CCDP)** The CCDP is another advanced certification. It's aimed at high-level internetwork designers who must understand the intricate facets of putting together a well-laid-out network. The first step in the certification process is to obtain the CCNA and CCDA certifications (yes, both). As with the CCNP, you must pass the Foundation Routing/Switching exam (number 640-409) or pass the ACRC, CLSC, and CMTD exams individually. Once you meet those objectives, you must pass the CID exam to complete the certification.

➤ **Cisco Certified Internetworking Expert (CCIE)** The CCIE is possibly the most influential certification 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, which qualifies you to schedule time at a Cisco campus to demonstrate your knowledge in a two-day practical laboratory setting. You must pass the lab with a score of at least 80 percent to become a CCIE. Recent

statistics have put the passing rates at roughly 2 percent for first attempts and 35 through 50 percent overall. Once you achieve CCIE certification, you must recertify every two years by passing a written exam administered by Cisco.

➤ **Certified Cisco Systems Instructor (CCSI)** To obtain status as a CCSI, you must be employed (either permanently or by contract) by a Cisco Training Partner in good standing, such as GeoTrain Corp. That training partner must sponsor you through Cisco's Instructor Certification Program, and you must pass the two-day program that Cisco administers at a Cisco campus. You can expand on CCSI certification on a class-by-class basis. Instructors must demonstrate competency with each class they are to teach thereafter by completing the written exam that goes with each class. Cisco also requires that instructors maintain a high customer satisfaction rating, or they will face decertification.

Taking A Certification Exam

Alas, testing is not free. Each computer-based exam costs between $100 and $200. If you do not pass, you must pay the testing fee each time you retake the test. In the United States and Canada, tests are administered by Sylvan Prometric. Sylvan Prometric can be reached at (800) 755-3926 or (800) 204-EXAM, any time from 7:00 A.M. to 6:00 P.M., Central Time, Monday through Friday. You can also try (612) 896-7000 or (612) 820-5707.

To schedule an exam, call at least one day in advance. To cancel or reschedule an exam, you must call at least 24 hours before the scheduled test time (or you may be charged regardless). When calling Sylvan Prometric, have the following information ready for the telesales staffer who handles your call:

➤ Your name, organization, and mailing address.

➤ Your Cisco Test ID. (For most U.S. citizens, this is your Social Security number. Citizens of other nations can use their taxpayer IDs or make other arrangements with the order taker.)

➤ The name and number of the exam you wish to take. For this book, the exam name is "Advanced Cisco Router Configuration (ACRC)," and the exam number is 640-403.

➤ A method of payment. The most convenient approach is to supply a valid credit card number with sufficient available credit. Otherwise, Sylvan Prometric must receive check, money order, or purchase order payments before you can schedule a test. (If you're not paying by credit card, ask your order taker for more details.)

When you show up to take a test, try to arrive at least 15 minutes before the scheduled time slot. You must bring and supply two forms of identification, one of which must be a photo ID.

All exams are completely closed book. In fact, you will not be permitted to take anything with you into the testing area. However, you are furnished with a blank sheet of paper and a pen. We suggest that you immediately write down on that sheet of paper all the information you've memorized for the test. While the amount of time you have to actually take the exam is limited, it does not start until you tell it to. So you can spend as much time as necessary writing notes on the provided paper. If you think you will need more paper than what is provided, ask the test center administrator before entering the exam room. You must return all pages prior to exiting the testing center.

In Exam Cram books, the information that we suggest you write down appears on a tear-out sheet inside the front cover of each book. You will have some time to compose yourself, to record this information, and even to take a sample orientation exam before you must begin the real thing. We suggest you take the orientation test before taking your first exam, but because they're all more or less identical in layout, behavior, and controls, you probably won't need to do this more than once.

When you complete a Cisco certification exam, the software will tell you whether you've passed or failed. All tests are scored on a basis of 100 percent, and results are broken into several topic areas. Even if you fail, we suggest you ask for—and keep—the detailed report that the test administrator should print for you. You can use this report to help you prepare for another go-round, 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 have it print twice.

If you need to retake an exam, you'll have to call Sylvan Prometric, schedule a new test date, and pay another testing fee. Cisco has recently implemented a new policy regarding failed tests. The first time you fail a test, you can retake the test the next day. However, if you fail a second time, you must wait 14 days before retaking that test. The 14-day waiting period is in effect for all tests after the first failure.

Tracking Cisco Certification Status

As soon as you pass any Cisco exam (congratulations!), you must complete a certification agreement. You can do so online at the Certification Tracking Web site (www.galton.com/~cisco/), or you can 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 form or the other.

The Certification Tracking Web site also allows you to view your certification information. Cisco will contact you via email and explain it and its use. Once you are registered into one of the career certification tracks, you will be given a login on this site, which is administered by Galton, a third-party company that has no in-depth affiliation with Cisco or its products. Galton's information comes directly from Sylvan Prometric, the exam-administration company for much of the computing industry.

Once you pass the necessary exam(s) for a particular certification and complete the certification agreement, you'll be certified. Official certification normally takes anywhere from four to six weeks, so don't expect to get your credentials overnight. When the package arrives, it will include a Welcome Kit that contains a number of elements, including:

➤ A Cisco certificate stating that you have completed the certification requirements, suitable for framing, along with a laminated Cisco Career Certification identification card with your certification number on it.

➤ A promotional item, which varies based on the certification. For example, for CCNA, you will receive a CCNA shirt, whereas a CCDA gets you a leather (or reasonable facsimile thereof) organizer folder.

Many people believe that the benefits of the Cisco career certifications go well beyond the perks that Cisco provides to newly anointed members of this elite group. We're starting to see more job listings that request or require applicants to have a CCNA, CCDA, CCNP, CCDP, and so on, and many individuals who complete the program can qualify for increases in pay or responsibility. In fact, Cisco has started to implement requirements for its Value Added Resellers: To attain and keep silver, gold, or higher status, they must maintain a certain number of CCNA, CCDA, CCNP, CCDP, and CCIE employees on staff. There's a very high demand and low supply of Cisco talent in the industry overall. As an official recognition of hard work and broad knowledge, a Cisco career certification credential is a badge of honor in many IT organizations.

How To Prepare For An Exam

Preparing for any Cisco test (including ACRC) requires that you obtain and study materials designed to provide comprehensive information about Cisco router operation and the specific exam for which you are preparing. The following list of materials will help you study and prepare:

➤ **Instructor-led training** There's no substitute for expert instruction and hands-on practice under professional supervision. Cisco Training Partners, such as GeoTrain Corporation, offer instructor-led training courses for all of the Cisco career certification requirements. These