



31 Days Before Your CCNA Routing and Switching Exam

Third Edition

Allan Johnson



A Day-By-Day Review Guide for the
ICND2 (200-101) Certification Exam

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About the Author

Allan Johnson entered the academic world in 1999 after 10 years as a business owner/operator to dedicate his efforts to his passion for teaching. He holds both an MBA and an MEd in Occupational Training and Development. He taught CCNA courses at the high school level for 7 years and has taught both CCNA and CCNP courses at Del Mar College in Corpus Christi, Texas. In 2003, Allan began to commit much of his time and energy to the CCNA Instructional Support Team, providing services to Networking Academy instructors worldwide and creating training materials. He now works full time for Cisco Networking Academy as a Learning Systems Developer.

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Steve Stiles is a Cisco Network Academy Instructor for Rhodes State College and a Cisco Certified Instructor Trainer, having earned CCNA Security and CCNP-level certifications. He was the recipient of the 2012 Outstanding Teacher of the Year by the Ohio Association of Two Year Colleges and co-recipient for the Outstanding Faculty of the Year at Rhodes State College.

Dedication

For my wife, Becky. Without the sacrifices you made during the project, this work would not have come to fruition. Thank you for providing me the comfort and resting place only you can give.

Acknowledgments

When I began to think of whom I would like to have as a technical editor for this work, Steve Stiles immediately came to mind. With his instructor and industry background, in addition to his excellent work building activities for the new Cisco Networking Academy curriculum, he was an obvious choice. Thankfully, when Mary Beth Ray contacted him, he was willing and able to do the arduous review work necessary to make sure that you get a book that is both technically accurate and unambiguous.

This book is a concise summary of the work of Cisco Press CCNA authors. Wendell Odom's *Cisco CCENT/CCNA ICND2 200-101 Official Cert Guide* and John Tiso's *Interconnecting Cisco Network Devices, Part 2 (ICND2) Foundation Learning Guide* were two of my main sources. The different approaches these two authors—both CCIEs—take toward the CCNA material gives the reader the breadth and the depth needed to master the CCNA exam topics.

The Cisco Network Academy authors for the online curriculum and series of Companion Guides take the reader deeper, past the CCNA exam topics, with the ultimate goal of not only preparing the student for CCNA certification, but for more advanced college-level technology courses and degrees, as well. Thank you especially to Amy Gerrie and her team of authors—Rick Graziani, Wayne Lewis, and Bob Vachon—for their excellent treatment of the material; it is reflected throughout this book.

Mary Beth Ray, executive editor, amazes me with her ability to juggle multiple projects simultaneously, steering each from beginning to end. I can always count on her to make the tough decisions. Thank you, Mary Beth, for bringing this project to me.

I've lost count, but this may be the tenth project with Christopher Cleveland as development editor. His dedication to perfection pays dividends in countless, unseen ways. Thank you again, Chris, for providing me with much needed guidance and support. This book could not be a reality without your persistence.

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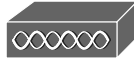
Icons Used in This Book



Router



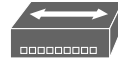
Wireless Router



Wireless Access Point



Hub



Hub (alternate)



Multilayer Switch



Switch



ATM Switch Relay Switch



WAN Switch



PBX Switch



Cisco ASA



Router with Firewall



PIX Firewall



Firewall



VPN Concentrator



DSLAM



CSU/DSU



Access Server



Voice-Enabled Access Server



Modem



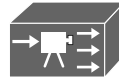
IP Phone



Phone



Server



IP/TV Broadcast Server



Network Management Server



Web Server



Laptop



PC



Network Cloud



Ethernet Connection



Serial Line Connection



Wireless Connection

Command Syntax Conventions

The conventions used to present command syntax in this book are the same conventions used in the IOS Command Reference. The Command Reference describes these conventions as follows:

- **Boldface** indicates commands and keywords that are entered literally as shown. In actual configuration examples and output (not general command syntax), boldface indicates commands that are manually input by the user (such as a **show** command).
- *Italic* indicates arguments for which you supply actual values.
- Vertical bars (|) separate alternative, mutually exclusive elements.
- Square brackets ([]) indicate an optional element.
- Braces ({ }) indicate a required choice.
- Braces within brackets ({ [] }) indicate a required choice within an optional element.

Introduction

If you're reading this Introduction, you've probably already spent a considerable amount of time and energy pursuing your CCNA certification. You're taking one of two paths. Either you've passed the Interconnecting Cisco Network Devices Part 1 (ICND1 100-101) exam and are now just about ready to take the second exam, ICND2 200-101, or you are planning on taking the full Cisco Certified Network Associate Exam (CCNA 200-120). If you are on the second path, hopefully you also purchased *31 Days Before Your CCENT Certification Exam* (ISBN: 9781587204531), because this book only addresses topics covered on the ICND2 exam. Regardless of how you got to this point in your travels through your CCNA studies, *31 Days Before Your CCNA Certification Exam* most likely represents the last leg of your journey on your way to the destination: to become a Cisco Certified Network Associate. However, if you are like me, you might be reading this book at the *beginning* of your studies. If so, this book provides an excellent overview of the material you must now spend a great deal of time studying and practicing. But I must warn you; unless you are extremely well versed in networking technologies and have considerable experience configuring and troubleshooting Cisco routers and switches, this book will *not* serve you well as the sole resource for your exam preparations. Therefore, let me spend some time discussing my recommendations for study resources.

Study Resources

Cisco Press offers an abundance of CCNA-related books to serve as your primary source for learning how to install, configure, operate, and troubleshoot small- to medium-size routed and switched networks.

NOTE: The following discussion focuses mainly on resources for the ICND2 exam. If you are taking the CCNA 200-120 exam, refer to the Study Resources recommendation in the Introduction of the *31 Days Before Your CCENT Certification Exam* book (9781587204531).

Primary Resources

First on the list must be Wendell Odom's *Cisco CCNA Routing and Switching ICND2 200-101 Official Cert Guide* (ISBN: 9781587143731). If you do not buy any other books, buy this one. Wendell's method of teaching, combined with his technical expertise and down-to-earth style, is unsurpassed in our industry. As you read through his books, you sense that he is sitting right there next to you walking you through the material. The practice exams and study materials on the DVD in the back of the book are worth the price of the book. There is no better resource on the market for a CCNA candidate.

Next on the list must be John Tiso's *Interconnecting Cisco Network Devices, Part 2 (ICND2) Foundation Learning Guide* (ISBN: 9781587143779). This book is indispensable to those students who take the second of two Cisco recommended training classes for CCNA preparation: Interconnecting Cisco Network Devices 2 (ICND2). These courses, available through Cisco Training Partners in a variety of formats, are usually of a very short duration (1 to 6 weeks) and are geared toward the industry professional already working

in the field of networking. John's book serves the reader well as a concise, but thorough, treatment of the CCNA exam topics. His method and approach often differ and complement Wendell's approach. I recommend that you also refer to this book.

If you are a Cisco Networking Academy student, you are blessed with access to the online version of the CCNA Routing and Switching curriculum and the wildly popular Packet Tracer network simulator. Although there are currently two paths for the CCNA curriculum, I used the Scaling Networks (SN) and Connecting Networks (CN) courses in my daily review of the exam topics. SN describes the architecture, components, and operations of routers and switches in larger and more complex networks. Students learn how to configure routers and switches for advanced functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement a WLAN in a small- to medium-size network. CN discusses the WAN technologies and network services required by converged applications in a complex network. The course enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Students learn how to configure and troubleshoot network devices and resolve common issues with data-link protocols. Students also develop the knowledge and skills needed to implement virtual private network (VPN) operations in a complex network. To learn more about CCNA Routing and Switching courses and to find an Academy near you, visit <http://www.netacad.com>.

However, if you are not an Academy student but want to benefit from the extensive authoring done for these courses, you can buy any or all of CCNA Routing and Switching Companion Guides (CGs) and Lab Manuals (LMs) of the Academy's popular online curriculum. Although you will not have access to the Packet Tracer network simulator software, you will have access to the tireless work of an outstanding team of Cisco Academy instructors dedicated to providing students with comprehensive and engaging CCNA preparation course material. The titles and ISBNs for the CCNA Routing and Switching CGs and LMs are as follows:

- *Scaling Networks Companion Guide* (ISBN: 9781587133282)
- *Scaling Networks Lab Manual* (ISBN: 9781587133251)
- *Connecting Networks Companion Guide* (ISBN: 9781587133329)
- *Connecting Networks Lab Manual* (ISBN: 9781587133312)

You can find these books at <http://www.ciscopress.com> by clicking the Cisco Networking Academy link.

Supplemental Resources

In addition to the book you hold in your hands, I recommend four more supplemental resources to augment your final 31 days of review and preparation.

First, a plug for my own book, the *CCNA Practice and Study Guide, Exercises, Activities and Scenarios to Prepare for the ICND2/CCNA* (ISBN: 9781587133442). The subtitle is a concise summary of what you will get. Although an appropriate resource for anyone,

this book is specifically geared toward the Cisco Networking Academy instructors and students who want a resource to supplement the online curriculum. Mirroring the chapter layout of the last two online courses, the CCNA PSG offers exercises that help you learn the concepts and configurations that are crucial to your success as a CCNA candidate.

Second, Wendell Odom and Sean Wilkins have created more than 250 structured labs that are available in the Cisco CCNA 200-120 Network Simulator. These simulations map precisely to chapters in their book, but are also a great practice resource for anyone. The four types of labs in this product present you with progressively more difficult real-world challenges:

- Skill builder labs help you practice short, focused configuration tasks.
- Subnetting exercises help you improve the speed and accuracy of your subnetting calculations.
- Complex configuration scenario labs present realistic multi-layered, multi-technology configuration tasks.
- Challenging troubleshooting scenario labs provide you with an opportunity to test your problem identification and resolution skills.

If you need that extra edge or are struggling with a particular configuration or troubleshooting concept, you'll find these simulations very helpful.

Third, Eric Rivard is the author of *Cisco CCNA 200-120 Flash Cards and Exam Practice Pack* (ISBN: 9781587204005). The text portion of the book includes more than 450 flash cards that quickly review exam topics in bite-sized pieces. Also included are more than 100 pages in the Quick Reference Guide, which is designed for late-stage exam preparation. And on the included CD, you will find a test engine with more than 150 CCENT and CCNA practice exam questions.

Fourth, there is Scott Empson's very popular *CCNA Routing and Switching Portable Command Guide*, Third Edition (ISBN: 9781587204302). This guide is much more than just a listing of commands and what they do. Yes, it summarizes all the CCNA certification-level IOS commands, keywords, command arguments, and associated prompts. But it also provides you with tips and examples of how to apply the commands to real-world scenarios. Configuration examples throughout the book provide you with a better understanding of how these commands are used in simple network designs.

The Cisco Learning Network

Finally, if you have not done so already, you should now register with The Cisco Learning Network at <https://learningnetwork.cisco.com>. Sponsored by Cisco, The Cisco Learning Network is a free social learning network where IT professionals can engage in the common pursuit of enhancing and advancing their IT careers. Here you can find many resources to help you prepare for your CCNA exam, in addition to a community of like-minded people ready to answer your questions, help you with your struggles, and share in your triumphs.

So, which resources should you buy? The answer to that question depends largely on how deep your pockets are or how much you like books. If you're like me, you must have it all! I admit it. My bookcase is a testament to my Cisco "geekness." But if you are on a budget, choose one of the primary study resources and one of the supplemental resources (such as Wendell Odom's certification book and my practice study guide). Whatever you choose, you will be in good hands. Any or all of these authors will serve you well.

Goals and Methods

The main goal of this book is to provide you with a clear and succinct review of the CCNA objectives. Each day's exam topics are grouped into a common conceptual framework and use the following format:

- A title for the day that concisely states the overall topic
- A list of one or more CCNA 200-101 exam topics to be reviewed
- A "Key Topics" section to introduce the review material and quickly orient you to the day's focus
- An extensive review section consisting of short paragraphs, lists, tables, examples, and graphics
- A "Study Resources" section to provide you a quick reference for locating more in-depth treatment of the day's topics

The book counts down starting with Day 31 and continues through exam day to provide post-test information. Inside this book, you will also find a calendar and checklist that you can tear out and use during your exam preparation.

Use the calendar to enter each actual date beside the countdown day and the exact day, time, and location of your CCNA exam. The calendar provides a visual for the time that you can dedicate to each CCNA exam topic.

The checklist highlights important tasks and deadlines leading up to your exam. Use it to help you map out your studies.

Who Should Read This Book?

The audience for this book is anyone finishing preparation for taking the CCNA 200-101 ICND2 exam. A secondary audience is anyone needing a refresher review of CCNA exam topics—possibly before attempting to recertify or sit for another certification for which the CCNA is a prerequisite.

Getting to Know the CCNA 200-201 Exam

For the current certifications, announced in Spring 2013, Cisco created the ICND1 (100-101) and ICND2 (200-101) exams, along with the CCNA (200-120) exam. To become CCENT certified, you need to pass just the ICND1 exam. To become CCNA Routing and Switching certified, you must pass both the ICND1 and ICND2 exams, or just the CCNA exam. The CCNA exam simply covers all the topics on the ICND1 and ICND2 exams,

giving you two options for gaining your CCNA Routing and Switching certification. The two-exam path gives people with less experience a chance to study for a smaller set of topics at one time. The one-exam option provides a more cost-effective certification path for those who want to prepare for all the topics at once. This book focuses exclusively on the second exam of two-exam path using the entire list of topics published for the CCNA 200-101 ICND2 exam.

Currently for the CCNA exam, you are allowed 90 minutes to answer 50–60 questions. Use the following steps to access a tutorial at home that demonstrates the exam environment before you go to take the exam:

Step 1 Visit <http://www.vue.com/cisco>.

Step 2 Look for a link to the certification tutorial. Currently, it appears on the right side of the web page under the heading “Related Links.”

Step 3 Click the Certification Tutorial link.

When you get to the testing center and check in, the proctor verifies your identity, gives you some general instructions, and then takes you into a quiet room containing a PC. When you're at the PC, you have a few things to do before the timer starts on your exam. For instance, you can take the tutorial to get accustomed to the PC and the testing engine. Every time I sit for an exam, I go through the tutorial even though I know how the test engine works. It helps me settle my nerves and get focused. Anyone who has user-level skills in getting around a PC should have no problems with the testing environment.

When you start the exam, you are asked a series of questions. Each question is presented one at a time and must be answered before moving on to the next question. The exam engine does not let you go back and change your answer. The exam questions can be in one of the following formats:

- Multiple choice
- Fill in the blank
- Drag and drop
- Testlet
- Simlet
- Simulation

The multiple-choice format simply requires that you point and click a circle or check box next to the correct answer or answers. Cisco traditionally tells you how many answers you need to choose, and the testing software prevents you from choosing too many or too few.

Fill-in-the-blank questions usually only require you to type numbers. However, if words are requested, the case does not matter unless the answer is a command that is case sensitive (such as passwords and device names when configuring authentication).

Drag-and-drop questions require you to click and hold, move a button or icon to another area, and release the mouse button to place the object somewhere else—usually in a list. For some questions, to get the question correct, you might need to put a list of five things in the proper order.

Testlets contain one general scenario and several multiple-choice questions about the scenario. These are ideal if you are confident in your knowledge of the scenario's content because you can leverage your strength over multiple questions.

A simlet is similar to a testlet in that you are given a scenario with several multiple-choice questions. However, a simlet uses a network simulator to allow you access to a simulation of the command line of Cisco IOS Software. You can then use **show** commands to examine a network's current behavior and answer the question.

A simulation also uses a network simulator, but you are given a task to accomplish such as implementing a network solution or troubleshooting an existing network implementation. You do this by configuring one or more routers and switches. The exam then grades the question based on the configuration you changed or added. A newer form of the simulation question is the GUI-based simulation, where a graphical interface like that found on a Linksys router or Cisco's Security Device Manager is simulated.

What Topics Are Covered on the CCNA Exam

The topics of the CCNA 200-101 ICND2 exam focus on the following five key categories:

- LAN switching technologies
- IP routing technologies
- IP services
- Troubleshooting
- WAN technologies

Although Cisco outlines general exam topics, it is possible that not all topics will appear on the CCNA exam and that topics that are not specifically listed might appear on the exam. The exam topics provided by Cisco and included in this book are a general framework for exam preparation. Be sure to check Cisco's website for the latest exam topics.

Registering for the CCNA 200-101 ICND2 Exam

If you are starting your *31 Days to Your CCNA Certification Exam* today, register for the exam right now. In my testing experience, there is no better motivator than a scheduled test date staring me in the face. I'm willing to bet it's the same for you. Don't worry about unforeseen circumstances. You can cancel your exam registration for a full refund up to 24 hours before taking the exam. So, if you're ready, gather the following information in Table I-1 and register right now!

Table I-1 Personal Information for CCNA 200-101 ICND2 Exam Registration

| Item | Notes |
|--|--------------|
| Legal Name | |
| Social Security or Passport Number | |
| Cisco Certification ID or Test ID ¹ | |
| Cisco Academy Username ² | |
| Cisco Academy ID Number ² | |
| Company Name | |
| Valid Email Address | |
| Voucher Number ² | |
| Method of Payment | |

¹Applies to exam candidates who have previously taken a Cisco certification exam

²Applies to Cisco Networking Academy students only

To register for an exam, visit Pearson VUE online at <http://www.vue.com/cisco>. The process and available test times will vary based on the local testing center you choose.

Remember, there is no better motivation for study than an actual test date. *Sign up today.*

Spanning Tree Protocols

CCNA 200-101 ICND2 Exam Topics

- Identify enhanced switching technologies

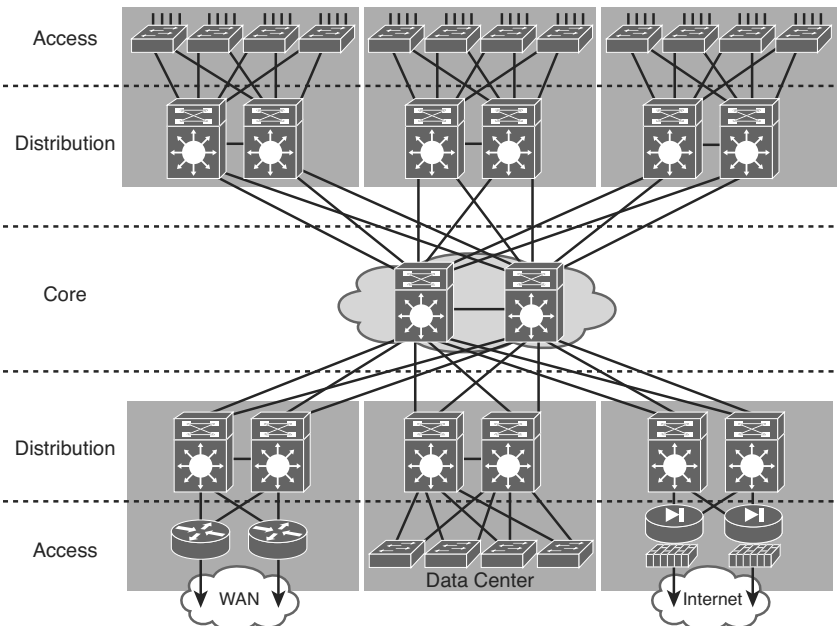
Key Topics

Part I focuses on switching technologies, including Spanning Tree Protocol (STP), EtherChannel, and first-hop redundancy protocols (FHRPs). Today's review covers STP and its variations, standards that allow for redundant switched networks without worrying about switching loops.

STP Concepts and Operation

One of the key characteristics of a well-built communications network is its resiliency. This means that the network needs to be able to handle a device or link failure through redundancy. A redundant topology can eliminate a single point of failure by using multiple links, multiple devices, or both. Spanning Tree Protocol (STP) helps to prevent loops in a redundant switched network. Figure 31-1 shows an example of a three-layer topology (core, distribution, access) with redundant links.

Figure 31-1 Redundant Switched Topology



Without STP, redundancy in the switched network could introduce the following issues:

- **Broadcast storms:** Each switch floods broadcasts endlessly, called a broadcast storm.
- **Multiple frame transmission:** Multiple copies of unicast frames may be delivered to the destination, causing unrecoverable errors.
- **MAC database instability:** Instability in the content of the MAC address table results from copies of the same frame being received on different ports of the switch.

STP Algorithm

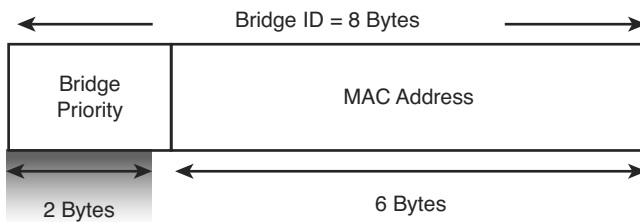
STP is an IEEE committee standard defined as 802.1D. STP places certain ports in the blocking state so that they do not listen to, forward, or flood data frames. STP creates a tree that ensures that only one path exists to each network segment at any one time. Then, if any segment experiences a disruption in connectivity, STP rebuilds a new tree by activating the previously inactive, but redundant, path.

The algorithm used by STP chooses the interfaces that should be placed into a forwarding state. For any interfaces not chosen to be in a forwarding state, STP places the interfaces in blocking state.

Switches exchange STP configuration messages every 2 seconds by default using a multi-cast frame called the bridge protocol data unit (BPDU). One of the pieces of information included in the BPDU is the bridge ID (BID).

As shown in Figure 31-2, the BID is unique to each switch and is composed of a priority value (2 bytes) and the bridge MAC address (6 bytes).

Figure 31-2 Bridge ID



The default priority is 32,768. The root bridge is the bridge with the lowest BID. Therefore, if the default priority value is not changed, the switch with the lowest MAC address becomes root.

STP Convergence

STP convergence is the process by which the switches collectively realize that something has changed in the LAN topology and so the switches might need to change which ports block and which ports forward. The following steps summarize the STP algorithm used to achieve convergence:

- Step 1** Elect a root bridge (switch with lowest BID). There can be only one root bridge per network. All ports on the root bridge are forwarding ports.
- Step 2** Elect a root port for each nonroot switch, based on lowest root path cost. Each nonroot switch has one root port. The root port is the port through which the nonroot bridge has its best path to the root bridge.
- Step 3** Elect a designated port for each segment, based on the lowest root path cost. Each link will have one designated port.
- Step 4** The root ports and designated ports transition to the forwarding state, and the other ports stay in the blocking state.

Table 31-1 summarizes the reasons STP places a port in forwarding or blocking state.

Table 31-1 STP: Reasons for Forwarding or Blocking

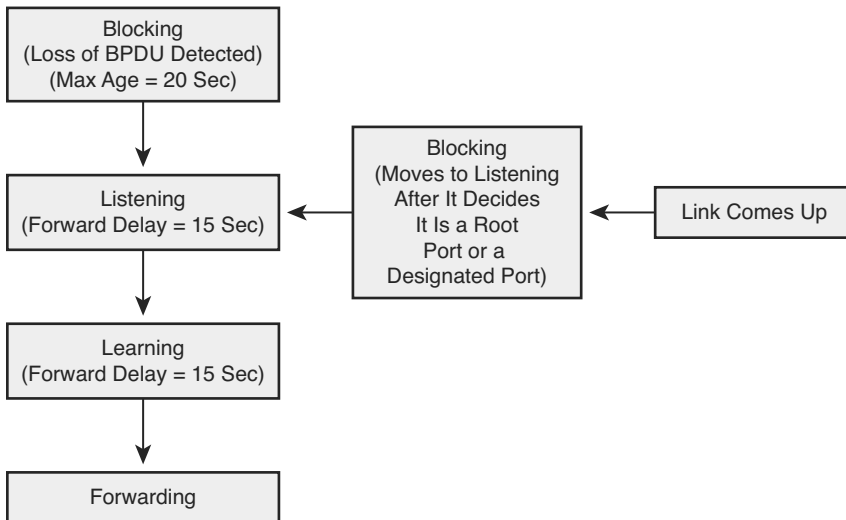
| Characterization of Port | STP State | Description |
|---------------------------------|------------|--|
| All the root switch's ports | Forwarding | The root switch is always the designated switch on all connected segments. |
| Each nonroot switch's root port | Forwarding | The port through which the switch has the least cost to reach the root switch. |
| Each LAN's designated port | Forwarding | The switch forwarding the lowest-cost BPDU onto the segment is the designated switch for that segment. |
| All other working ports | Blocking | The port is not used for forwarding frames, nor are any frames received on these interfaces considered for forwarding. |

Port bandwidth is used to determine the cost to reach the root bridge. Table 31-2 lists the default port costs defined by IEEE, which had to be revised with the advent of 10-Gbps ports.

Table 31-2 Default IEEE Port Costs

| Ethernet Speed | Original IEEE Cost | Revised IEEE Cost |
|----------------|--------------------|-------------------|
| 10 Mbps | 100 | 100 |
| 100 Mbps | 10 | 19 |
| 1 Gbps | 1 | 4 |
| 10 Gbps | 1 | 2 |

STP uses the four states shown in Figure 31-3 as a port transitions from blocking to forwarding.

Figure 31-3 Spanning Tree Port States

A fifth state, disabled, occurs either when a network administrator manually disables the port or a security violation disables the port.

STP Varieties

Several varieties of STP have emerged after the original IEEE 802.1D:

- **STP:** The original specification of STP, defined in 802.1D, provides a loop-free topology in a network with redundant links. STP is sometimes referred to as Common Spanning Tree (CST) because it assumes one spanning tree instance for the entire bridged network, regardless of the number of VLANs.
- **PVST+:** Per-VLAN Spanning Tree Plus is a Cisco enhancement of STP that provides a separate 802.1D spanning tree instance for each VLAN configured in the network.
- **RSTP:** Rapid STP, or IEEE 802.1w, is an evolution of STP that provides faster convergence than STP. However, RSTP still only provides for a single instance of STP.
- **Rapid PVST+:** Cisco enhancement of RSTP that uses PVST+. Rapid PVST+ provides a separate instance of 802.1w per VLAN.
- **Multiple Spanning Tree Protocol:** MSTP is an IEEE standard inspired by the earlier Cisco proprietary Multiple Instance STP (MISTP) implementation. MSTP maps multiple VLANs into the same spanning tree instance. The Cisco implementation of MSTP is MST, which provides up to 16 instances of RSTP and combines many VLANs with the same physical and logical topology into a common RSTP instance.

Part of your switch administration skill set is the ability to decide which type of STP to implement. Table 31-3 summarizes the features of each STP flavor.

Table 31-3 Features of STP Varieties

| Protocol | Standard | Resources Needed | Convergence | Tree Calculation |
|-------------|---------------|------------------|-------------|------------------|
| STP | 802.1D | Low | Slow | All VLANs |
| PVST+ | Cisco | High | Slow | Per VLAN |
| RSTP | 802.1w | Medium | Fast | All VLANs |
| Rapid PVST+ | Cisco | Very high | Fast | Per VLAN |
| MSTP | 802.1s, Cisco | Medium or high | Fast | Per instance |

Study Resources

For today's exam topics, refer to the following resources for more study.

| Resource | Location | Topic |
|---------------------------------|----------|--------------------------------------|
| Primary Resources | | |
| Switched Networks | 4 | Spanning Tree Concepts |
| | | Varieties of Spanning Tree Protocols |
| Scaling Networks | 2 | Spanning Tree Concepts |
| | | Varieties of Spanning Tree Protocols |
| ICND2 Official Cert Guide | 1 | All |
| ICND2 Foundation Learning Guide | 1 | Building Redundant Switch Topologies |
| Supplemental Resources | | |
| CCNA Practice and Study Guide | 2 | Spanning Tree Concepts |
| | | Varieties of Spanning Tree Protocols |
| CCNA ICND2 Flash Cards | 2 | Questions 1–37 |

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CCNA Countdown Calendar

The line after the countdown number allow you to add the actual calendar days for reference.

| | | | | | | |
|---|--|---|--|--|--|--|
| 31 <hr/> Spanning Tree Protocols | 30 <hr/> PVST and Rapid PVST+ Operation and Configuration | 29 <hr/> EtherChannel Concepts and Configuration | 28 <hr/> Routing Processes and Protocols | 27 <hr/> Booting the Router | 26 <hr/> IOS Images and Licensing | 25 <hr/> Backing Up and Restoring Files |
| 24 <hr/> OSPFv2 Modification | 23 <hr/> OSPFv3 Modification | 22 <hr/> EIGRP Concepts | 21 <hr/> EIGRP for IPv4 Implementation | 20 <hr/> EIGRP for IPv6 Implementation | 19 <hr/> Varieties of FHRP | 18 <hr/> FHRP Configurations |
| 17 <hr/> SNMP and Syslog | 16 <hr/> Utilizing NetFlow | 15 <hr/> Troubleshooting Methodology | 14 <hr/> Troubleshooting STP and EtherChannel | 13 <hr/> Troubleshooting Inter-VLAN Routing | 12 <hr/> Troubleshooting Routing | 11 <hr/> Troubleshooting OSPF |
| 10 <hr/> Troubleshooting EIGRP | 9 <hr/> WAN Technology Overview | 8 <hr/> WAN Connection Options and VPNs | 7 <hr/> Serial Connections | 6 <hr/> PPP | 5 <hr/> Frame Relay | 4 <hr/> PPPoE |
| 3 <hr/> Troubleshooting WAN Issues | 2 <hr/> NAT | 1 <hr/> CCNA Skills Review and Practice | EXAM DAY <hr/> Time <hr/> Location <hr/> | | | |

Exam Checklist

| CCNA Checklist Days 31–20 | | |
|---------------------------|------|--|
| Check Box | Date | Objective |
| | | Schedule to take the CCNA or ICND2 exam at http://www.vue.com . |
| | | Take at least 1 practice CCNA exam. |
| | | Describe the process of STP convergence. |
| | | Compare the varieties of STP. |
| | | Describe the operations allowed for each PVST port state. |
| | | Explain the difference between PVST+ and Rapid PVST+. |
| | | Design a set of requirements to implement a 2-switch topology with Rapid PVST+. Configure the primary and secondary root. Use appropriate show commands to verify your configurations. |
| | | Describe the benefits of EtherChannel. Compare the two EtherChannel protocols. |
| | | Design a set of requirements to implement a 2-switch topology with EtherChannel. Review implementation issues by changing the configuration parameters. |
| | | Compare the features of interior gateway protocols. |
| | | Explain to someone you know how the Dijkstra algorithm calculates best paths. |
| | | Explain the default router boot sequence and the process to modify it. |
| | | Explain the concept of software families and trains. |
| | | Describe the process to install and remove software licenses. |
| | | Describe the Cisco IOS file system and the process for backing up and restoring files. |
| | | Describe the ways to modify OSPFv2 and OSPFv3, including redistributing a default route, modifying timers, authenticating updates, and controlling the DR/BDR election. |
| | | Describe the types of OSPF routers and types of OSPF LSAs used in multi-area OSPF. |
| | | Describe EIGRP characteristics, including PDMs, RTP, packet types, composite metric, and DUAL. |
| | | Design a set of requirements to implement EIGRP for IPv4 and IPv6 on a dual-stack 2-router topology. |
| | | Specify modifications for an EIGRP for IPv4 and IPv6 implementation to summarize routes, authenticate updates, fine-tune the timers, and redistribute a default route. |
| | | Read and review Days 31–20 in this book. |
| CCNA Checklist Days 19–10 | | |
| Check Box | Date | Objective |
| | | Take at least 2 practice CCNA exams. |
| | | Compare HSRP and GLBP. |
| | | Design a set of requirements to implement HSRP in a 2-router topology. Change the requirements to implement GLBP. |

| | | Explain the basic SNMP and syslog operation. |
|-------------------------|------|--|
| | | Design a set of requirements to implement SNMP and syslog in a 2-router, 1-server topology. |
| | | Describe basic NetFlow operation and configuration. |
| | | For each of the troubleshooting days, have a friend introduce a few errors in your previous designs. Then use your troubleshooting skills to isolate and resolve the problem. If you are working solo, make a list of potential issues and the steps you would take to resolve each one. |
| | | Read and review Days 19–10 in this book. |
| CCNA Checklist Days 9–1 | | |
| Check Box | Date | Objective |
| | | Define common WAN terminology. |
| | | Compare various WAN connection options. |
| | | Describe types of VPNs and components needed to establish a VPN connection. |
| | | Compare the various VPN encryption and authentication methodologies. |
| | | Design a set of requirements to implement a VPN using the IPsec framework. |
| | | Describe the characteristics of GRE. |
| | | Design a set of requirements to implement GRE in a 2-router topology. |
| | | Describe the operation of PPP. |
| | | Design a set of requirements to implement PPP with CHAP in a 2-router topology. |
| | | Describe the main components of Frame Relay. |
| | | Describe the purpose and operation of inverse ARP and LMI. |
| | | Design a set of requirements to implement Frame Relay in a full-mesh 3-router topology. |
| | | Design a set of requirements to implement Frame Relay in a partial-mesh with 1 subnet per PVC 3-router topology. |
| | | Describe the concept of PPPoE. |
| | | Design a set of requirements to implement PPPoE in a 2-router topology. |
| | | For each of your WAN technology implementations, have a friend introduce a few errors. Then use your troubleshooting skills to isolate and resolve the problem. If you are working solo, make a list of potential issues and the steps you would take to resolve each one. |
| | | Review Day 2, “NAT,” in detail and refresh yourself on this CCENT/ICND1 topic in case you see NAT on the CCNA exam. |
| | | Configure the network from Day 1, “CCNA Skills Review and Practice,” without using any references or the answer scripts. |
| | | Attempt all elements of the CCNA Skills Challenge at the end of Day 1. You will find this after the answer scripts. |
| | | Read and review Days 9–1 in this book. |
| | | Visit the testing center and talk with the proctor at least 2 days before the exam. |
| | | Eat a decent meal, watch a good movie, and get a good night’s rest before the exam. |