Official
Cert Guide

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CCNP Security FIREWALL 642-618

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CCNP Security FIREWALL 642-618 Official Cert Guide

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David lives in Kentucky with his wife, Marci, and two daughters.

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Dedications

From David Hucaby:

As always, this book is dedicated to the most important people in my life: my wife, Marci, and my two daughters, Lauren and Kara. Their love, encouragement, and support carry me along. I'm so grateful to God, who gives endurance and encouragement (Romans 15:5), and who has allowed me to work on projects like this.

From Dave Garneau:

I am also dedicating this book to the most important people in my life: my wife, Vicki, our daughters, Elise and Lauren, and my stepson, Ben. Without their love and support, I doubt I would succeed in any major endeavor, much less one of this magnitude. Additionally, I want to dedicate this book to my mother, Marian, who almost 40 years ago, believed a very young version of myself when he declared he would one day grow up and write a book. I am glad I was finally able to live up to that promise.

From Anthony Sequeira:

This book is dedicated to the many, many students I have had the privilege of teaching over the past several decades. I hope that my passion for technology and learning has conveyed itself and helped motivate—and perhaps even inspire.

Acknowledgments

It has been my great pleasure to work on another Cisco Press project. I enjoy the networking field very much—and technical writing even more. And more than that, I'm thankful for the joy and inner peace that Jesus Christ gives, making everything more abundant and worthwhile.

I've now been writing Cisco Press titles continuously for more than 10 years. I always find it to be quite fun, but other demands seem to be making writing more difficult and time-consuming. That's why I am so grateful that Dave Garneau and Anthony Sequeira came along to help tote the load. It's also been a great pleasure to work with Brett Bartow and Chris Cleveland. I'm glad they put up with me yet again, especially considering how much I let the schedule slip.

I am grateful for the insight, suggestions, and helpful comments that the technical editors contributed. Each one offered a different perspective, which helped make this a more well-rounded book—and me a more educated author.

—David Hucaby

The creation of this book has certainly been a maelstrom of activity. I was originally slated to be one of the technical reviewers, but became a coauthor at David Hucaby's request.

Right after accepting that challenge, I started a new job, moved to a new city, and built a new house. Throughout all the resulting chaos, Brett Bartow and Christopher Cleveland demonstrated the patience of Job, while somehow keeping this project on track. Hopefully, their patience was not exhausted, and I look forward to working with them again on future projects.

I am also thankful to our technical reviewers for their meticulous attention to detail. The input of Doug McKillip and Kenny Hackworth, both of whom I count as a close friends, was invaluable. The extremely thorough reviews provided by Doug and Kenny definitely improved the quality of the material for the end readers.

—Dave Garneau

Brett Bartow is a great friend, and I am so incredibly thankful to him for the awesome opportunities he has helped me to achieve with the most respected line of IT texts in the world, Cisco Press. I am also really thankful that he continues to permit me to participate in his fantasy baseball league.

It was such an honor to help on this text with the incredible David Hucaby and Dave Garneau. While they sought out a third author named David, it was so kind of them to make a concession for an Anthony.

I cannot thank David Hucaby enough for the assistance he provided me in accessing the latest and greatest Cisco ASAs for the lab work and experimentation that was required for my chapters of this text.

Finally, thanks to my family, Joette and Annabella and the dog Sweetie, for understanding all the hours I spent hunched over a keyboard. That reminds me, thanks also to my chiropractor, Dr. Paton.

—Anthony Sequeira

Contents at a Glance

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Icons Used in This Book

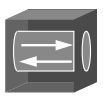

Cisco ASA


IPS


Content Services Module


AAA Server


CA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IPsec VPN Gateway


Router


Layer 3 Switch

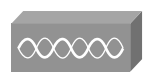

Layer 2 Switch


PC


IP Phone


Server


Network Cloud


Access Point


Wireless Connection

Ethernet Connection

Introduction

This book helps you prepare for the Cisco FIREWALL 642-618 certification exam. The FIREWALL exam is one in a series of exams required for the Cisco Certified Network Professional Security (CCNP Security) certification. This exam focuses on the application of security principles with regard to the Cisco Adaptive Security Appliance (ASA) device.

Who Should Read This Book

Network security is a complex business. It is important that you have extensive experience in and an in-depth understanding of computer networking before you can begin to apply security principles. The Cisco FIREWALL program was developed to introduce the ASA security products, explain how each product is applied, and explain how it can be leveraged to increase the security of your network. The FIREWALL program is for network administrators, network security administrators, network architects, and experienced networking professionals who are interested in applying security principles to their networks.

How to Use This Book

This book consists of 17 chapters. Each chapter tends to build upon the chapter that precedes it. Each chapter includes case studies or practice configurations that can be implemented using both the command-line interface (CLI) and Cisco Adaptive Security Device Manager (ASDM).

The chapters of this book cover the following topics:

- **Chapter 1, "Cisco ASA Adaptive Security Appliance Overview":** This chapter discusses basic network security and traffic filtering strategies. It also provides an overview of ASA operation, including the ASA feature set, product licensing, and how various ASA models should be matched with the environments they will protect.
- **Chapter 2, "Working with a Cisco ASA":** This chapter reviews the basic methods used to interact with an ASA and to control its basic operation. Both the CLI and ASDM are discussed.
- **Chapter 3, "Configuring ASA Interfaces":** This chapter explains how to configure ASA interfaces with the parameters they need to operate on a network.
- **Chapter 4, "Configuring IP Connectivity":** This chapter covers the ASA features related to providing IP addressing through DHCP and to exchanging IP routing information through several different dynamic routing protocols.
- **Chapter 5, "Managing a Cisco ASA":** This chapter reviews the configuration commands and tools that can be used to manage and control an ASA, both locally and remotely.

- **Chapter 6, "Recording ASA Activity":** This chapter describes how to configure an ASA to generate logging information that can be collected and analyzed. The logging information can be used to provide an audit trail of network and security activity.
- **Chapter 7, "Using Address Translation":** This chapter describes how IP addresses can be altered or translated as packets move through an ASA. The various types of Network Address Translation (NAT) and Port Address Translation (PAT) are covered. This chapter covers address translation methods for OS versions both before and after 8.3, where translation configuration was completely transformed.
- **Chapter 8, "Controlling Access Through the ASA":** This chapter reviews access control lists and host shunning, and how these features can be configured to control traffic movement through an ASA.
- **Chapter 9, "Inspecting Traffic":** This chapter covers the Modular Policy Framework, a method used to define and implement many types of traffic inspection policies. It also covers ICMP, UDP, TCP, and application protocol inspection engines, as well as more advanced inspection tools, such as Botnet Traffic Filtering and threat detection.
- **Chapter 10, "Using Proxy Services to Control Access":** This chapter discusses the features that can be leveraged to control the authentication, authorization, and accounting (AAA) of users as they pass through an ASA.
- **Chapter 11, "Handling Traffic":** This chapter covers the methods and features that can be used to handle fragmented traffic, to prioritize traffic for QoS, to police traffic rates, and to shape traffic bandwidth.
- **Chapter 12, "Using Transparent Firewall Mode":** This chapter reviews transparent firewall mode and how it can be used to make an ASA more stealthy when introduced into a network. The ASA can act as a transparent bridge, forwarding traffic at Layer 2.
- **Chapter 13, "Creating Virtual Firewalls on the ASA":** This chapter discusses the multiple context mode that can be used to allow a single physical ASA device to provide multiple virtual firewalls or security contexts.
- **Chapter 14, "Deploying High Availability Features":** This chapter covers two strategies that can be used to implement high availability between a pair of ASAs.
- **Chapter 15, "Integrating ASA Service Modules":** This chapter explains the basic steps needed to configure an ASA to work with the AIP and CSC Security Services Modules (SSM), which can be used to offload in-depth intrusion protection and content handling.
- **Chapter 16, "Traffic Analysis Tools":** This chapter discusses two troubleshooting tools that you can use to test and confirm packet movement through an ASA.
- **Chapter 17, "Final Preparation":** This short chapter lists the exam preparation tools useful at this point in the study process and provides a suggested study plan now that you have completed all the earlier chapters in this book.

- **Appendix A, "Answers to the 'Do I Know This Already?' Quizzes":** This appendix provides the answers to the "Do I Know This Already?" quizzes that you will find at the beginning of each chapter.
- **Appendix B, "CCNP Security 642-618 FIREWALL Exam Updates: Version 1.0":** This appendix provides you with updated information if Cisco makes minor modifications to the exam upon which this book is based. When Cisco releases an entirely new exam, the changes are usually too extensive to provide in a simple update appendix. In those cases, you need to consult the new edition of the book for the updated content. This additional content about the exam will be posted as a PDF document on this book's companion website (www.ciscopress.com/title/9781587142796).
- **Glossary of Key Terms:** This glossary defines the key terms that appear at the end of each chapter, for which you should be able to provide definitions on your own in preparation for the exam.

Each chapter follows the same format and incorporates the following tools to assist you by assessing your current knowledge and emphasizing specific areas of interest within the chapter:

- **"Do I Know This Already?" Quiz:** Each chapter begins with a quiz to help you assess your current knowledge of the subject. The quiz is divided into specific areas of emphasis that enable you to best determine where to focus your efforts when working through the chapter.
- **Foundation Topics:** The foundation topics are the core sections of each chapter. They focus on the specific protocols, concepts, or skills that you must master to successfully prepare for the examination.
- **Exam Preparation:** Near the end of each chapter, the Exam Preparation section highlights the key topics from the chapter and the pages where you can find them for quick review. This section also provides a list of key terms that you should be able to define in preparation for the exam. It is unlikely that you will be able to successfully complete the certification exam by just studying the key topics and key terms, although they are a good tool for last-minute preparation just before taking the exam.
- **Command References:** Each chapter ends with a series of tables containing the commands that were covered. The tables provide a convenient place to review the commands, their syntax, and the sequence in which they should be used to configure a feature.
- **CD-ROM-based practice exam:** This book includes a CD-ROM containing several interactive practice exams. It is recommended that you continue to test your knowledge and test-taking skills by using these exams. You will find that your test-taking skills will improve by continued exposure to the test format. Remember that the potential range of exam questions is limitless. Therefore, your goal should not be to "know" every possible answer but to have a sufficient understanding of the subject matter so that you can figure out the correct answer with the information provided.

Certification Exam and This Preparation Guide

The questions for each certification exam are a closely guarded secret. The truth is that if you had the questions and could only pass the exam, you would be in for quite an embarrassment as soon as you arrived at your first job that required these skills. The point is to know the material, not just to successfully pass the exam.

We do know which topics you must know to successfully complete this exam because Cisco publishes them as "642-618 Deploying Cisco ASA Firewall Solutions Exam Topics (Blueprint)" on the Cisco Learning Network. Table I-1 lists each FIREWALL v2.0 exam topic listed in the blueprint along with a reference to the chapter that covers the topic. These are the same topics you should be proficient in when configuring the Cisco ASA in the real world.

Table I-1 *FIREWALL v2.0 Exam Topics and Chapter References*

Exam Topic	Chapter Where Topic Is Covered
ASA Basic Configurations	
Identify the ASA product family	Chapters 1, 15
Implement ASA licensing	Chapter 1
Manage the ASA boot process	Chapter 2
Implement ASA interface settings	Chapters 3, 8
Implement ASA management features	Chapters 2, 4, 5, 6, 16
Implement ASA access control features	Chapters 8, 10
Implement NAT on the ASA	Chapter 7
Implement ASDM public server feature	Chapter 2
Implement ASA QoS settings	Chapter 11
Implement ASA transparent firewall	Chapter 12
ASA Routing Features	
Implement ASA static routing	Chapter 4
Implement ASA dynamic routing	Chapter 4
ASA Inspection Policy	
Implement ASA inspections features	Chapter 9
ASA Advanced Network Protections	
Implement ASA botnet traffic filter	Chapter 9
ASA High Availability	
Implement ASA interface redundancy and load sharing features	Chapter 3
Implement ASA virtualization feature	Chapter 13
Implement ASA stateful failover	Chapter 14

Notice that not all the chapters map to a specific exam topic. Each version of the exam can have topics that emphasize different functions or features, while some topics can be rather broad and generalized. The goal of this book is to provide the most comprehensive coverage to ensure that you are well prepared for the exam. In order to do this, all possible topics that have been addressed in different versions of this exam (past and present) are covered. Many of the chapters that do not specifically address exam topics provide a foundation that is necessary for a clear understanding of network security. Your short-term goal might be to pass this exam, but your long-term goal should be to become a qualified network security professional.

It is also important to understand that this book is a "static" reference, whereas the exam topics are dynamic. Cisco can and does change the topics covered on certification exams often.

This exam guide should not be your only reference when preparing for the certification exam. You can find a wealth of information available at Cisco.com that covers each topic in great detail. The goal of this book is to prepare you as well as possible for the FIREWALL exam. Some of this is completed by breaking a 600-page (average) implementation guide into a 30-page chapter that is easier to digest. If you think that you need more detailed information on a specific topic, you should read the Cisco documentation that focuses on that topic.

Note that because security vulnerabilities and preventive measures continue to develop, Cisco reserves the right to change the exam topics without notice. Although you can refer to the list of exam topics listed in Table I-1, always check Cisco.com to verify the actual list of topics to ensure that you are prepared before taking the exam. You can view the current exam topics on any current Cisco certification exam by visiting the Cisco.com website, hovering over Training & Events, and selecting from the Certifications list. Note also that, if needed, Cisco Press might post additional preparatory content on the web page associated with this book at www.ciscopress.com/title/9781587142710. It's a good idea to check the website a few weeks before taking your exam to be sure that you have up-to-date content.

Overview of the Cisco Certification Process

The network security market is currently in a position where the demand for qualified engineers vastly surpasses the supply. For this reason, many engineers consider migrating from routing/networking over to network security. Remember that "network security" is just "security" applied to "networks." This sounds like an obvious concept, but it is actually an important one if you are pursuing your CCNP Security certification. You must be familiar with networking before you can begin to apply the security concepts. For example, the skills required to complete the CCNA or CCNP will give you a solid foundation that you can expand into the network security field.

Taking the FIREWALL Certification Exam

As with any Cisco certification exam, you should strive to be thoroughly prepared before taking the exam. There is no way to determine exactly what questions are on the exam, so the best way to prepare is to have a good working knowledge of all subjects covered on the exam. Schedule yourself for the exam and be sure to be rested and ready to focus when taking the exam.

The best place to find out the latest available Cisco training and certifications is under the Training & Events section at Cisco.com.

Tracking Cisco Certification Status

You can track your certification progress by checking www.cisco.com/go/certifications/login. You must create an account the first time you log in to the site.

How to Prepare for an Exam

The best way to prepare for any certification exam is to use a combination of the preparation resources, labs, and practice tests. This guide has integrated some practice questions and example scenarios to help you better prepare. If possible, you should get some hands-on experience with the Cisco ASA. There is no substitute for real-world experience; it is much easier to understand the commands and concepts when you can actually work with a live ASA device.

Cisco.com provides a wealth of information about the ASA and its software and features. No single source can adequately prepare you for the FIREWALL exam unless you already have extensive experience with Cisco products and a background in networking or network security. At a minimum, you will want to use this book combined with the Support and Downloads site resources (www.cisco.com/cisco/web/support/index.html) to prepare for the exam.

Assessing Exam Readiness

Exam candidates never know if they are adequately prepared for the exam until they have completed about 30 percent of the questions. At that point, if you are not prepared, it is too late. The best way to determine your readiness is to work through the "Do I Know This Already?" quizzes at the beginning of each chapter, review the foundation and key topics presented in each chapter, and review the command reference tables at the end of each chapter. It is best to work your way through the entire book unless you can complete each subject without having to do any research or look up any answers.

Cisco Security Specialist in the Real World

Cisco has one of the most recognized names on the Internet. Cisco Certified Security Specialists can bring quite a bit of knowledge to the table because of their deep understanding of the relationship between networking and network security. This is why the Cisco certification carries such high respect in the marketplace. Cisco certifications demonstrate to potential employers and contract holders a certain professionalism, expertise, and dedication required to complete a difficult goal. If Cisco certifications were easy to obtain, everyone would have them.

Exam Registration

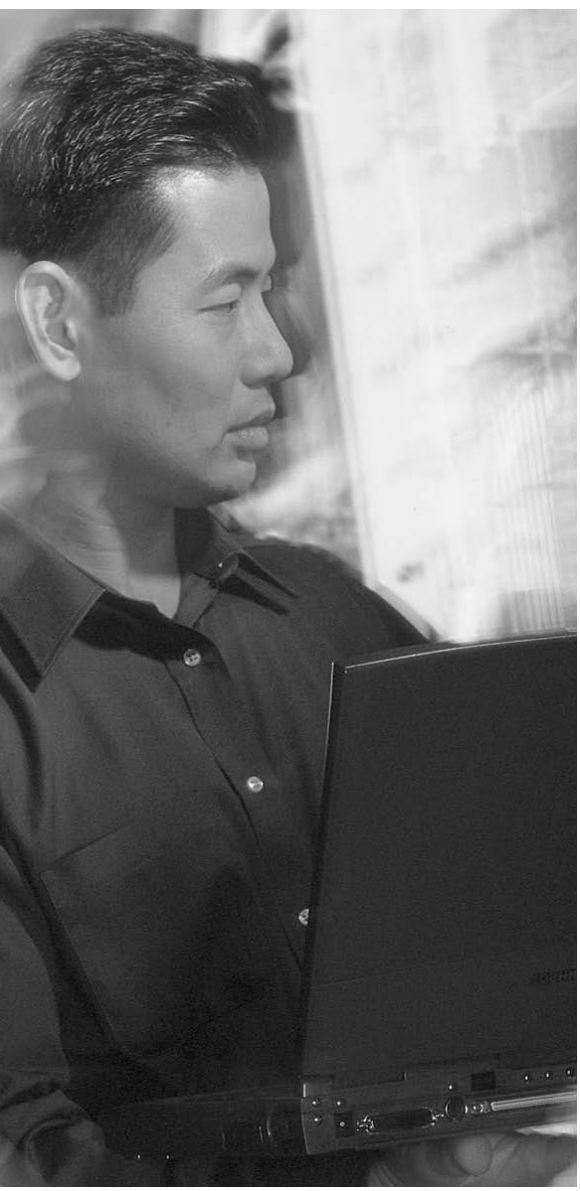
The FIREWALL exam is a computer-based exam, with around 60 to 70 multiple choice, fill-in-the-blank, list-in-order, and simulation-based questions. You can take the exam at any Pearson VUE (www.pearsonvue.com) testing center. According to Cisco, the exam should last about 90 minutes. Be aware that when you register for the exam, you might be told to allow a certain amount of time to take the exam that is longer than the testing time indicated by the testing software when you begin. This discrepancy is because the testing center will want you to allow for some time to get settled and take the tutorial about the test engine.

Book Content Updates

Because Cisco occasionally updates exam topics without notice, Cisco Press might post additional preparatory content on the web page associated with this book at http://www.ciscopress.com/title/9781587142710. It is a good idea to check the website a few weeks before taking your exam to review any updated content that might be posted online. We also recommend that you periodically check back to this page on the Cisco Press website to view any errata or supporting book files that may be available.

Premium Edition eBook and Practice Test

This Cert Guide contains a special offer for a 70% discount off the companion CCNP Security FIREWALL 642-618 Official Cert Guide Premium Edition eBook and Practice Test. The Premium Edition combines an eBook version of the text with an enhanced Pearson IT Certification Practice Test. By purchasing the Premium Edition, you get access to two eBook versions of the text: a PDF version and an EPUB version for reading on your tablet, eReader, or mobile device. You also get an enhanced practice test that contains an additional two full practice tests of unique questions. In addition, all the practice test questions are linked to the PDF eBook, allowing you to get more detailed feedback on each question instantly. To take advantage of this offer, you will need the coupon code included on the paper in the CD sleeve. Just follow the purchasing instructions that accompany the code to download and start using your Premium Edition today!



This chapter covers the following topics:

- **Configuring Physical Interfaces:** This section discusses Cisco ASA interfaces that can be connected to a network through physical cabling, as well as the parameters that determine how the interfaces will operate.
- **Configuring VLAN Interfaces:** This section covers logical interfaces that can be used to connect an ASA to VLANs over a trunk link.
- **Configuring Interface Security Parameters:** This section explains the parameters you can set to assign a name, an IP address, and a security level to an ASA interface.
- **Configuring the Interface MTU:** This section discusses the maximum transmission unit size and how it can be adjusted to set the largest possible Ethernet frame that can be transmitted on an Ethernet-based ASA interface.
- **Verifying Interface Operation:** This section covers the commands you can use to display information about ASA interfaces and confirm whether they are operating as expected.

CHAPTER 3

Configuring ASA Interfaces

A Cisco Adaptive Security Appliance (ASA) must be configured with enough information to begin accepting and forwarding traffic before it can begin doing its job of securing networks. Each of its interfaces must be configured to interoperate with other network equipment and to participate in the IP protocol suite. This chapter discusses each of these topics in detail.

"Do I Know This Already?" Quiz

The "Do I Know This Already?" quiz allows you to assess whether you should read this entire chapter thoroughly or jump to the "Exam Preparation Tasks" section. If you are in doubt about your answers to these questions or your own assessment of your knowledge of the topics, read the entire chapter. Table 3-1 lists the major headings in this chapter and their corresponding "Do I Know This Already?" quiz questions. You can find the answers in Appendix A, "Answers to the 'Do I Know This Already?' Quizzes."

Table 3-1 *"Do I Know This Already?" Section-to-Question Mapping*

Foundation Topics Section	Questions
Configuring Physical Interfaces	1–4
Configuring VLAN Interfaces	5–7
Configuring Interface Security Parameters	8–10
Configuring the Interface MTU	11
Verifying Interface Operation	12

Caution: The goal of self-assessment is to gauge your mastery of the topics in this chapter. If you do not know the answer to a question or are only partially sure of the answer, you should mark this question wrong for purposes of the self-assessment. Giving yourself credit for an answer you correctly guess skews your self-assessment results and might provide you with a false sense of security.

1. Which of the following answers describe an attribute of a redundant interface? (Choose all that apply.)
   a. A redundant interface load balances traffic across member interfaces.
   b. A redundant interface is made up of two or more physical interfaces.
   c. An ASA can have up to eight redundant interface pairs.
   d. Each member interface of a redundant interface cannot have its own security level.
   e. IP addresses must be applied to the member physical interfaces of a redundant interface.
   f. The member interfaces swap the active role when one of them fails.
2. What must happen for a member interface to take over the active role as part of a redundant interface?
   a. Three hello messages must be missed.
   b. The link status of the current active interface goes down.
   c. A member interface, which was previously active before it went down, regains its link status.
   d. Its member priority is higher than other member interfaces.
   e. A timer must expire.
3. Which ASA command can be used to display a list of all physical interfaces?
   a. **show interfaces physical**
   b. **show interface list**
   c. **show hardware**
   d. **show version**
   e. **show ports**
   f. **show**
4. Suppose you want to double the bandwidth between an ASA's outside interface and a neighboring switch. A single GigabitEthernet link exists today; a second link would also add redundancy. Which one of the following describes the best approach to meet the requirements?
   a. Bring up a second GigabitEthernet interface on the same VLAN as the first one.
   b. Configure the two interfaces as a redundant interface.
   c. Configure the two interfaces as an EtherChannel.
   d. Dual links are not possible on an ASA.

5. You have been assigned the task of configuring a VLAN interface on an ASA 5510. The interface will use VLAN 50. Which one of the following sets of commands should be entered first to accomplish the task?

   a.
   ```
   interface vlan 50
   no shutdown
   ```

   b.
   ```
   interface ethernet0/0
   no shutdown
   ```

   c.
   ```
   interface ethernet0/0.5
   vlan 50
   no shutdown
   ```

   d.
   ```
   interface ethernet0/0.50
   no shutdown
   ```

6. Which of the following are correct attributes of an ASA interface that is configured to support VLAN interfaces? (Choose all that apply.)

   a. The physical interface operates as an ISL trunk.
   b. The physical interface operates as an 802.1Q trunk.
   c. The subinterface numbers of the physical interface must match the VLAN number.
   d. All packets sent from a subinterface are tagged for the trunk link.
   e. An ASA can negotiate a trunk link with a connected switch.

7. Which one of the following answers contains the commands that should be entered on an ASA 5505 to create an interface for VLAN 6?

   a. **interface vlan 6**
   b. **vlan 6**
   c. **interface ethernet0/0.6**
   d. **interface ethernet0/0.6**

8. Which of the following represent security attributes that must be assigned to an active ASA interface when the ASA is in routed firewall mode? (Choose three answers.)

   a. IP address
   b. Access list
   c. Interface name
   d. Security level
   e. Interface priority
   f. MAC address

9. Which one of the following interfaces should normally be assigned a security level value of 100?

   a. outside
   b. dmz
   c. inside
   d. None of these answers are correct.

10. An ASA has two active interfaces, one with security level 0 and one with security level 100. Which one of the following statements is true?

    a. Traffic is permitted to be initiated from security level 0 toward security level 100.
    b. Traffic is permitted to be initiated from security level 100 toward security level 0.
    c. Traffic is not permitted in either direction.
    d. The interfaces must have the same security level by default before traffic can flow.

11. Suppose you are asked to adjust the MTU on the "inside" ASA interface Ethernet0/1 to 1460 bytes. Which one of the following answers contains the correct command(s) to enter?

    a.
    ```
    ciscoasa(config)# mtu 1460
    ```
    b.
    ```
    ciscoasa(config)# mtu inside 1460
    ```
    c.
    ```
    ciscoasa(config)# interface ethernet0/1
    ciscoasa(config-if)# mtu 1460
    ```
    d. None of these answers are correct; the MTU must be greater than 1500.

12. From the following output, which of the following statements are true about ASA interface Ethernet0/2? (Choose all that apply.)

```
ciscoasa# show nameif
Interface                  Name                       Security
Ethernet0/0                outside                      0
Ethernet0/1                inside                     100
Management0/0              management                 100
ciscoasa#
ciscoasa# show interface ethernet0/2
Interface Ethernet0/2 "", is administratively down, line protocol is down
  Hardware is i82546GB rev03, BW 100 Mbps, DLY 100 usec
        Auto-Duplex, Auto-Speed
        Input flow control is unsupported, output flow control is unsupported
        Available but not configured via nameif
        MAC address 001a.a22d.1dde, MTU not set
        IP address 10.1.1.1, subnet mask 255.255.255.0
        0 packets input, 0 bytes, 0 no buffer
        Received 0 broadcasts, 0 runts, 0 giants
        0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
        0 pause input, 0 resume input
        0 L2 decode drops
        0 packets output, 0 bytes, 0 underruns
        0 pause output, 0 resume output
        0 output errors, 0 collisions, 1 interface resets
        0 late collisions, 0 deferred
        0 input reset drops, 0 output reset drops, 0 tx hangs
        input queue (blocks free curr/low): hardware (255/255)
        output queue (blocks free curr/low): hardware (255/255)
ciscoasa#
```

a. The interface is configured and is live on the network.

b. The interface is not ready to use; the **no shutdown** command has not been issued.

c. The interface is not ready to use; it doesn't have an IP address configured.

d. The interface is not ready to use; it doesn't have a MAC address configured.

e. The interface is not ready to use; it doesn't have a security level configured.

f. The interface is not ready to use; it doesn't have an interface name configured.

Answer E might also be true, but you cannot confirm that a security level has been configured from the command output given. Because an interface name has not been configured with the **nameif** command, neither the interface name nor the security level is shown in the output.

Foundation Topics

Every ASA has one or more interfaces that can be used to connect to some other part of the network so that traffic can be inspected and controlled. ASA interfaces can be *physical*, where actual network media cables connect, or *logical*, where the interfaces exist internally and are passed to the network over a physical link. In this chapter, you learn how to configure both types of interfaces for connectivity and IP addressing.

In addition, to pass and inspect traffic, each interface must be configured with the following three security attributes:

- Interface name
- IP address and subnet mask
- Security level

You learn how to configure the security parameters in the section, "Configuring Interface Security Parameters."

Configuring Physical Interfaces

An ASA supports multiple physical interfaces that can be connected into the network or to individual devices. From the Configuration tab in Cisco ASDM, you can view the list of interfaces by selecting **Device Setup > Interfaces**, as shown in Figure 3-1.

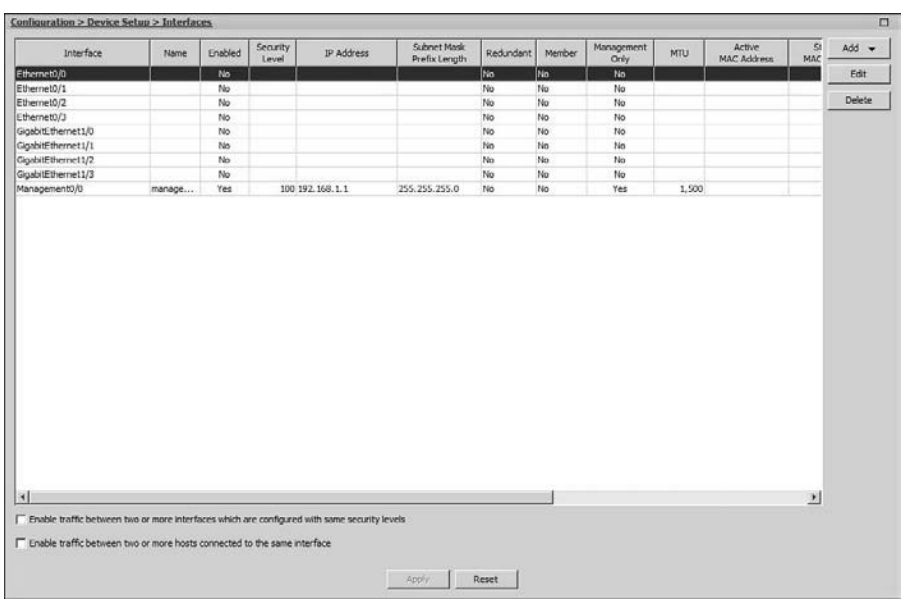


Figure 3-1 *Using ASDM to View a List of Interfaces*

From the CLI, you can see a list of the physical firewall interfaces that are available by using the following command:

```
ciscoasa# show version
```

Firewall interfaces are referenced by their hardware index and their physical interface names. Example 3-1 lists the physical interfaces in an ASA 5510. Ethernet0/0 through 0/3 and Management0/0 are built-in interfaces, while GigabitEthernet1/0 through 1/3 are installed as a 4GE-SSM module.

Example 3-1 *Listing Physical ASA Interfaces*

```
ciscoasa# show version

Cisco Adaptive Security Appliance Software Version 8.2(3)
Device Manager Version 6.3(4)

Compiled on Fri 06-Aug-10 07:51 by builders
System image file is "disk0:/asa823-k8.bin"
Config file at boot was "startup-config"

ciscoasa up 1 day 10 hours

Hardware:   ASA5510-K8, 256 MB RAM, CPU Pentium 4 Celeron 1600 MHz
Internal ATA Compact Flash, 256MB
BIOS Flash M50FW080 @ 0xffe00000, 1024KB

Encryption hardware device : Cisco ASA-55x0 on-board accelerator (revision 0x0)
                             Boot microcode   : CN1000-MC-BOOT-2.00
                             SSL/IKE microcode: CNLite-MC-SSLm-PLUS-2.03
                             IPSec microcode  : CNlite-MC-IPSECm-MAIN-2.04

 0: Ext: Ethernet0/0         : address is 001a.a22d.1ddc, irq 9
 1: Ext: Ethernet0/1         : address is 001a.a22d.1ddd, irq 9
 2: Ext: Ethernet0/2         : address is 001a.a22d.1dde, irq 9
 3: Ext: Ethernet0/3         : address is 001a.a22d.1ddf, irq 9
 4: Ext: Management0/0       : address is 001a.a22d.1ddb, irq 11
 5: Int: Internal-Data0/0    : address is 0000.0001.0002, irq 11
 6: Int: Not used            : irq 5
 7: Ext: GigabitEthernet1/0  : address is 001a.a22d.20f1, irq 255
 8: Ext: GigabitEthernet1/1  : address is 001a.a22d.20f2, irq 255
 9: Ext: GigabitEthernet1/2  : address is 001a.a22d.20f3, irq 255
10: Ext: GigabitEthernet1/3  : address is 001a.a22d.20f4, irq 255
11: Int: Internal-Data1/0    : address is 0000.0003.0002, irq 255

Licensed features for this platform:
Maximum Physical Interfaces    : Unlimited
```

```
Maximum VLANs                  : 100
Inside Hosts                   : Unlimited
Failover                       : Active/Active
VPN-DES                        : Enabled
[output truncated for clarity]
```

Before you begin configuring the ASA interfaces, you should first use the interface list to identify each of the interfaces you will use. At a minimum, you need one interface as the "inside" of the ASA and one as the "outside."

Default Interface Configuration

Some interfaces come predefined in the initial factory default configuration. You can view the interface mappings with the **show nameif** EXEC command. As shown in Example 3-2, an ASA 5510 or higher model defines only one interface, Management0/0, for use by default. The interface is named "management" and is set aside for out-of-band management access.

Example 3-2 *Default Interface Configuration on ASA 5510 and Higher Models*

```
ciscoasa# show nameif
Interface                Name                    Security
Management0/0            management              100
ciscoasa#
```

An ASA 5505 takes a different approach with its default interfaces, as shown in Example 3-3. Rather than use physical interfaces, it defines an "inside" and an "outside" interface using two logical VLANs: VLAN 1 and VLAN 2.

Example 3-3 *Default Interface Configuration on the ASA 5505*

```
ciscoasa# show nameif
Interface                Name                    Security
Vlan1                    inside                  100
Vlan2                    outside                   0
ciscoasa#
```

These two VLANs are then applied to the physical interfaces such that interface Ethernet0/0 is mapped to VLAN 2, while Ethernet0/1 through 0/7 are mapped to VLAN 1 (inside). This configuration gives one outside interface that can be connected to a service provider network for an Internet connection. The remaining seven inside interfaces can be connected to individual devices on the protected network.

You can display the ASA 5505 interface-to-VLAN mapping by entering the **show switch vlan** command, as shown in Example 3-4.

Example 3-4 *Displaying the ASA 5505 Interface-to-VLAN Mapping*

```
ciscoasa# show switch vlan
VLAN Name                            Status    Ports
---- ------------------------------- --------- ----------------------------
1    inside                          up        Et0/1, Et0/2, Et0/3, Et0/4
                                               Et0/5, Et0/6, Et0/7
2    outside                         up        Et0/0
ciscoasa#
```

Configuring Physical Interface Parameters

For each physical interface, you can configure the speed, duplex, and the interface state. In ASDM, select **Configuration > Interfaces**, select an interface, and click the **Edit** button. In the General tab, click **Configure Hardware Properties**, as shown in Figure 3-2.

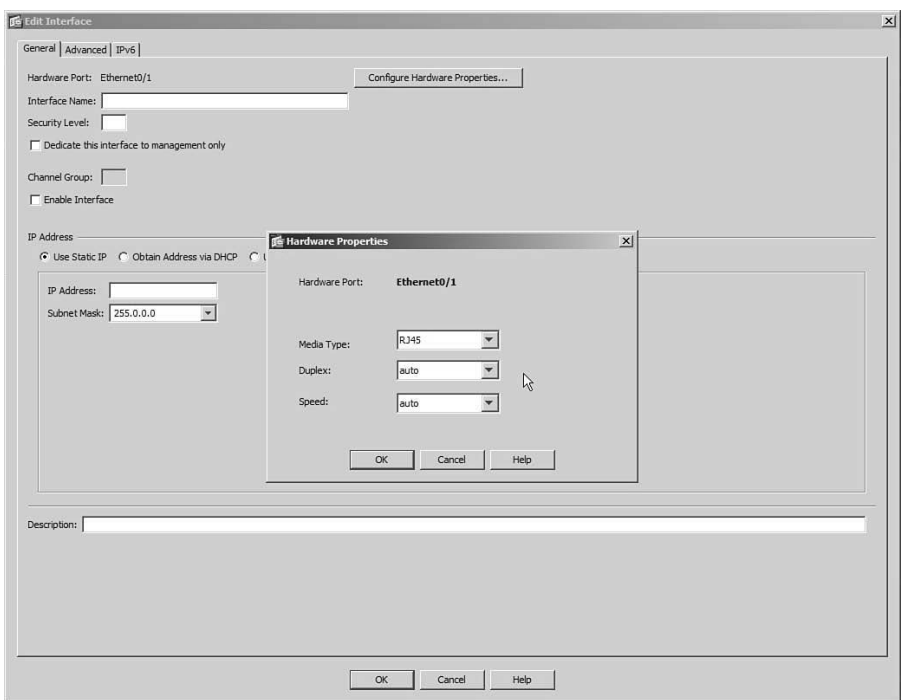


Figure 3-2 *Configuring Physical Interface Parameters in ASDM*

You can do the same task from the CLI by using the following commands:

```
ciscoasa(config)# interface hardware-id
ciscoasa(config-if)# speed {auto | 10 | 100 | 1000}
ciscoasa(config-if)# duplex {auto | full | half}
ciscoasa(config-if)# [no] shutdown
```

By default, an interface uses autodetected speed and autonegotiated duplex mode, as if the **speed auto** and **duplex auto** commands had been entered. As long as the ASA interface and the device connected to it are configured the same, the interface will automatically come up using the maximum speed and full-duplex mode. You can also statically configure the interface speed to **10**, **100**, or **1000** Mbps, as well as **full** or **half** duplex mode.

By default, physical interfaces are administratively shut down. Use the **no shutdown** interface configuration command to enable each one individually. As well, you can shut an interface back down with the **shutdown** command.

Note: Other parameters, such as the interface name, security level, and IP address, should be configured, too. These are discussed in the section, "Configuring Interface Security Parameters."

Mapping ASA 5505 Interfaces to VLANs

By default, an ASA 5505 maps interface Ethernet0/0 to VLAN 2 and interfaces Ethernet0/1 through 0/7 to VLAN 1. All eight interfaces are connected to an internal 8-port switch, with each interface configured as an access link mapped to a single VLAN.

Figure 3-3 shows how ASDM can be used to map a physical interface to a different VLAN number. First, a new interface is created and named vlan 10. At the top of the Add Interface dialog box, Ethernet0/3 is added to the list of interfaces that are mapped to VLAN 10.

You can use the following CLI command to accomplish the same task:

```
ciscoasa(config-if)# switchport access vlan vlan-id
```

The *vlan-id* parameter represents a VLAN interface that has already been created and configured. The section, "Configuring VLAN Interfaces," covers this in detail.

In Example 3-5, interface Ethernet0/3 is mapped to VLAN 10, while Ethernet0/4 is mapped to VLAN 20.

Example 3-5 *Mapping Interfaces to VLANs on an ASA 5505*

```
ciscoasa(config)# interface ethernet0/3
ciscoasa(config-if)# switchport access vlan 10
ciscoasa(config-if)# interface ethernet0/4
ciscoasa(config-if)# switchport access vlan 20
```

Configuring Interface Redundancy

By default, each physical ASA interface operates independently of any other interface. The interface can be in one of two operating states: up or down. When an interface is down for some reason, the ASA cannot send or receive any data through it. For example,

the switch port where an ASA interface connects might fail, causing the ASA interface to go down, too.

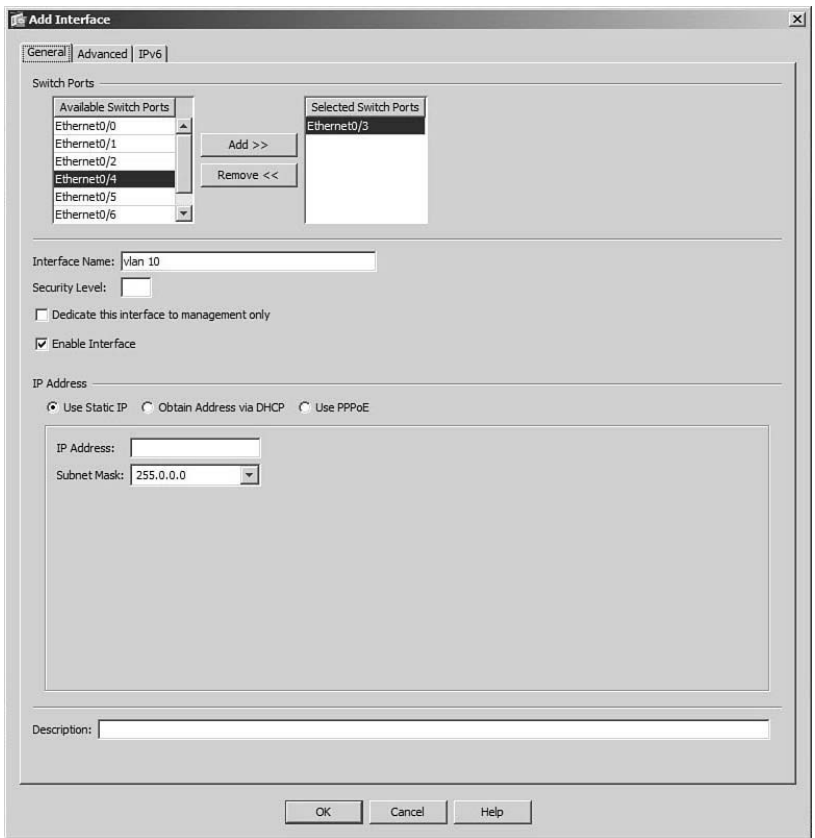


Figure 3-3 *Mapping an ASA 5505 Interface to a VLAN*

Key Topic

To keep an ASA interface up and active all the time, you can configure physical interfaces as redundant pairs. As a redundant pair, two interfaces are set aside for the same ASA function (inside, outside, and so on), and connect to the same network. Only one of the interfaces is active at any given time; the other interface stays in a standby state. As soon as the active interface loses its link status and goes down, the standby interface becomes active and takes over passing traffic.

Both physical interfaces in a redundant pair are configured as members of a single logical "redundant" interface. To join two interfaces as a redundant pair, the interfaces must be of the same type (10/100/1000BASE-TX, for example).

The redundant interface, rather than its physical member interfaces, is configured with a unique interface name, security level, and IP address—all the parameters used in ASA interface operations.

First, you must create the redundant interface by entering the following configuration command:

```
ciscoasa(config)# interface redundant number
```

You can define up to eight redundant interfaces on an ASA. Therefore, the interface *number* can be 1 through 8.

Next, use the following command to add a physical interface as a member of the redundant interface:

```
ciscoasa(config-int)# member-interface physical_interface
```

Here, *physical_interface* is the hardware name and number, like ethernet0/1 or gigabitethernet0/1, for example. In Figure 3-4, ASA interfaces Ethernet0/0 and Ethernet0/1 are member interfaces of a logical redundant interface called Redundant1, while Ethernet0/2 and Ethernet0/3 are members of interface Redundant2.

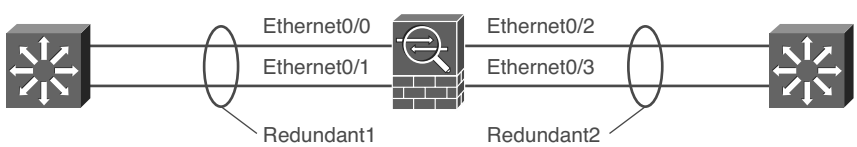


Figure 3-4 *Example Redundant Interfaces*

Be aware that the member interface cannot have a security level or an IP address configured. In fact, as soon as you enter the **member-interface** command, the ASA will automatically clear those parameters from the physical interface configuration. You should repeat this command to add a second physical interface to the redundant pair.

Keep in mind that the order in which you configure the interfaces is important. The first physical interface added to a logical redundant interface will become the active interface. That interface will stay active until it loses its link status, causing the second or standby interface to take over. The standby interface can also take over when the active interface is administratively shut down with the **shutdown** interface configuration command.

However, the active status will not revert to the failed interface, even when it comes back up. The two interfaces trade the active role back and forth only when one of them fails.

The redundant interface also takes on the MAC address of the first member interface that you configure. Regardless of which physical interface is active, that same MAC address will be used. You can override this behavior by manually configuring a unique MAC address on the redundant interface with the **mac-address** *mac_address* interface configuration command.

In Example 3-6, interfaces Ethernet0/0 and Ethernet0/1 are configured to be used as logical interface redundant 1.

Example 3-6 *Configuring a Redundant Interface Pair*

```
ciscoasa(config)# interface redundant 1
ciscoasa(config-if)# member-interface ethernet0/0
INFO: security-level and IP address are cleared on Ethernet0/0.
ciscoasa(config-if)# member-interface ethernet0/1
INFO: security-level and IP address are cleared on Ethernet0/1.
ciscoasa(config-if)# no shutdown
```

The redundant interface is now ready to be configured as a normal ASA interface. From this point on, you should not configure anything on the two physical interfaces other than the port speed and duplex.

Note: Make sure the logical redundant interface and the two physical interfaces are enabled with the **no shutdown** command. Even though they are all logically associated, they can be manually shut down or brought up independently.

To accomplish the same thing through ASDM, first select **Add > Redundant Interface** from the drop-down menu in the upper-right corner of the interface listing. A new Add Redundant Interface dialog box appears, as shown in Figure 3-5. Select the redundant interface number and the two physical interfaces that will operate as a redundant pair. To enable the new redundant interface for use, be sure to check the **Enable Interface** check box.

Note: Other parameters, such as the interface name, security level, and IP address, should be configured, too. These are discussed in the section, "Configuring Interface Security Parameters."

Configuring an EtherChannel

A single link between an ASA and a switch provides simple connectivity, but it is a single point of failure. If the link goes down, no data can travel across it. In the previous section, you learned that a redundant interface binds two physical interfaces into one logical interface. The possibility of a link failure is reduced, because one of the two interfaces will always be up and available; however, only one of the two links can pass data at any given time.

How can you maximize availability with more than one link, while leveraging the bandwidth of all of them at the same time? Beginning with ASA software release 8.4(1), you can use an EtherChannel to make that all possible. With an EtherChannel, two to eight active physical interfaces can be grouped or bundled together as a single logical port-channel interface. Each interface must be of the same type, speed, and duplex mode before an EtherChannel can be built.

Figure 3-6 shows an EtherChannel that is built out of multiple physical GigabitEthernet interfaces that connect an ASA to a Catalyst switch. On the ASA, the resulting logical interface is named interface port-channel 1. Notice that the individual links in the EtherChannel can have different interface names on each end. The interfaces can also be

connected and grouped in any arbitrary order. What matters is that the interfaces form one common EtherChannel link between the two devices.

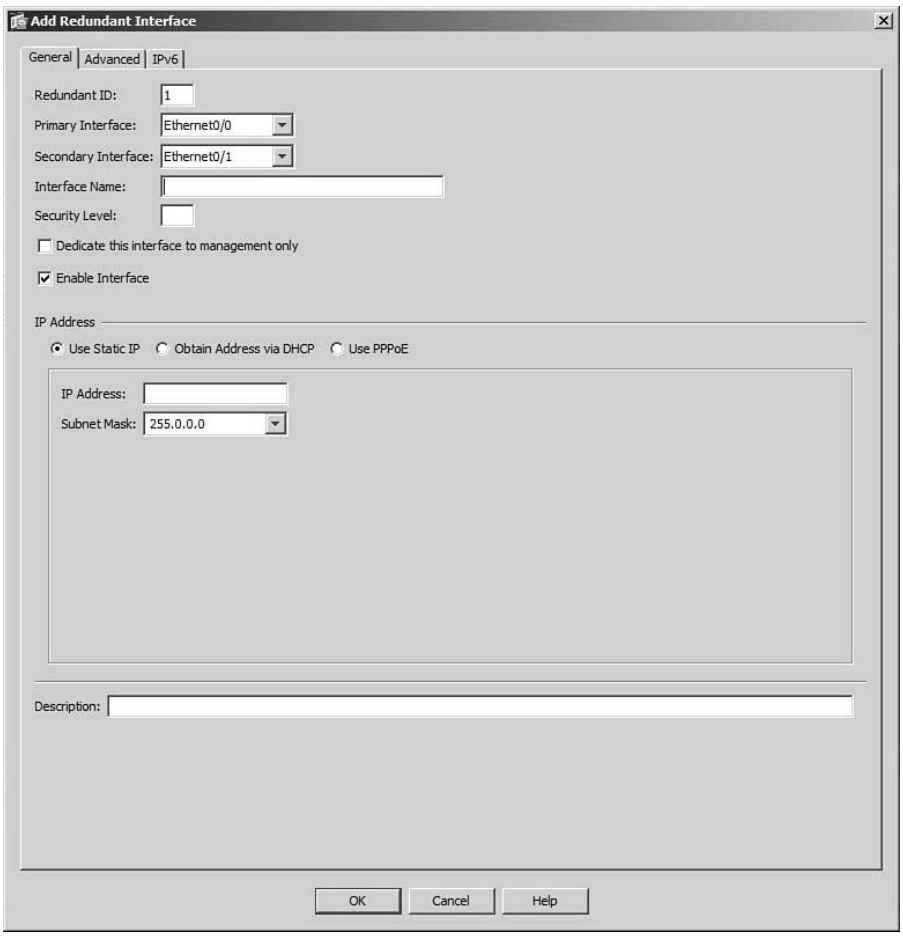


Figure 3-5 *Adding a Redundant Interface in ASDM*

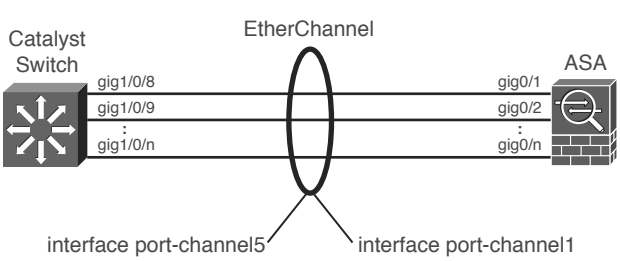


Figure 3-6 *Building an EtherChannel from Multiple Physical Links*

An ASA can support up to eight active interfaces in a single EtherChannel; however, you can configure up to 16 different interfaces per EtherChannel, although only eight of them can be active at any time. If one active interface fails, another one automatically takes its place. Although Figure 3-6 shows a single EtherChannel link, an ASA can support up to 48 different EtherChannels.

Because multiple interfaces are active in an EtherChannel, the available bandwidth can be scaled over that of a single interface. Traffic is load balanced by distributing the packets across the active interfaces. The ASA computes a hash value based on values found in the packet header, such as the source or destination MAC address, IP address, or the UDP or TCP port number. You can configure a preset combination of fields that are used. As long as the number of active interfaces is a multiple of two, the ASA can evenly distribute packets across them.

To build an EtherChannel, the ASA and the switch must both agree to do so. You can configure the ASA interfaces to statically participate, where the EtherChannel is "always on." In that case, the switch interfaces must also be configured for "always on" operation. Instead, you can configure the ASA and switch to negotiate an EtherChannel with each other.

Negotiation uses the Link Aggregation Control Protocol (LACP), which is a standards-based protocol. LACP packets are exchanged between the ASA and the switch over the interfaces that can become part of an EtherChannel. The ASA and the switch use a system priority (a 2-byte priority value followed by a 6-byte switch MAC address) to decide which one is allowed to make decisions about what interfaces are actively participating in the EtherChannel at a given time.

Interfaces are selected and become active according to their port priority value (a 2-byte priority followed by a 2-byte port number), where a low value indicates a higher priority. A set of up to 16 potential links can be defined for each EtherChannel. Through LACP, up to eight of these having the lowest port priorities can become active EtherChannel links at any given time. The other links are placed in a standby state and will be enabled in the EtherChannel if one of the active links goes down.

LACP can be configured in the active mode, in which the ASA actively asks a far-end switch to negotiate an EtherChannel, or in passive mode, in which the ASA negotiates an EtherChannel only if the far end initiates it. Table 3-2 summarizes the EtherChannel negotiation methods and characteristics.

Table 3-2 *EtherChannel Negotiation Methods*

Negotiation Mode	Negotiation Packets Sent?	Characteristics
On	No	All ports channeling all the time
Passive	Yes	Waits to channel until asked
Active	Yes	Actively asks to form a channel

To configure an EtherChannel in ASDM, begin by defining the port-channel interface. Select **Configuration > Device Setup > Interfaces**, click the **Add** button, and select

EtherChannel Interface. Under the General tab, enter an arbitrary Port Channel ID number (1 to 48) that will identify the port-channel interface.

Next, select an interface from the Available Physical Interface list and click the **Add>>** button to make it a member of the EtherChannel. You can repeat this process to add multiple interfaces. Make sure to select the Enable Interface check box to enable the port-channel interface for use. In Figure 3-7, interface port-channel1 has been created. Ethernet0/2 and Ethernet0/3 have been added as member interfaces.

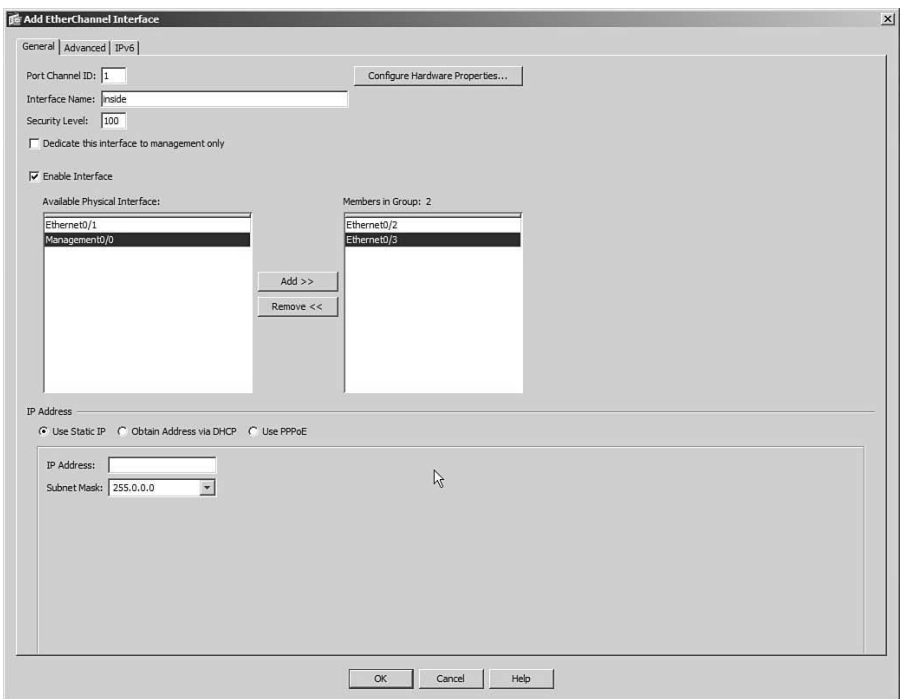


Figure 3-7 *Configuring a New EtherChannel in ASDM*

Note: Before an interface can be configured for an EtherChannel, it must not have a name configured. After the EtherChannel interfaces are configured, you can define a name and other security parameters on the port-channel interface.

Notice that Figure 3-7 also has fields for Interface Name, Security Level, and IP Address. These fields are not applied to the individual member interfaces; instead, they are applied to the port-channel interface. The fields are covered in the section, "Configuring Interface Security Parameters."

Next, configure the method that the ASA will use to distribute packets across the links within the EtherChannel. By default, a packet's source and destination IP addresses are used to compute a hash index that points to the link that will carry the packet. This is the appropriate choice in most cases, as long as the source and destination IP addresses are

unique and diverse. The more varied the hash input values, the better the traffic will be distributed across the links in the EtherChannel.

In some scenarios, the majority of the traffic might travel between the same two IP addresses, causing most of the packets to travel over only one link of the EtherChannel. In that case, you can configure the EtherChannel load-balancing method to use additional information, such as a Layer 4 port number, MAC addresses, or a VLAN number, to provide more uniqueness so that the packets can be spread more evenly across the EtherChannel links. The possible load-balancing methods are as follows:

- Destination IP
- Destination IP and Layer 4 Port
- Destination MAC Address
- Destination Layer 4 Port
- Source and Destination IP Address
- Source and Destination MAC Address
- Source and Destination IP Address and Layer 4 Port
- Source and Destination Layer 4 Port
- Source IP Address
- Source IP Address and Layer 4 Port
- Source MAC Address
- Source Layer 4 Port
- VLAN Destination IP Address
- VLAN Destination IP and Layer 4 Port
- VLAN Only
- VLAN Source and Destination IP Address
- VLAN Source and Destination IP Address and Layer 4 Port
- VLAN Source IP Address
- VLAN Source IP Address and Layer 4 Port

To configure the load-balancing method, select the **Advanced** tab in the Add EtherChannel Interface screen and choose the method from the drop-down list at the bottom of the screen, as shown in Figure 3-8.

Next, you need to configure a negotiation method for the EtherChannel. ASDM uses a default method of "active" on each member interface, where the ASA will use LACP to actively ask the far-end switch to bring up the EtherChannel. To configure the method, select **Configuration > Device Setup > Interfaces**, select an interface that is a member of the EtherChannel, and click the **Edit** button. In Figure 3-9, interfaces Ethernet0/2 and 0/3

are shown to be members of the Port-channel1 group. Because their individual configurations are restricted, they are shown with a lock icon next to their names. Remember that the security parameters of an EtherChannel are configured on the Port-channel interface instead.

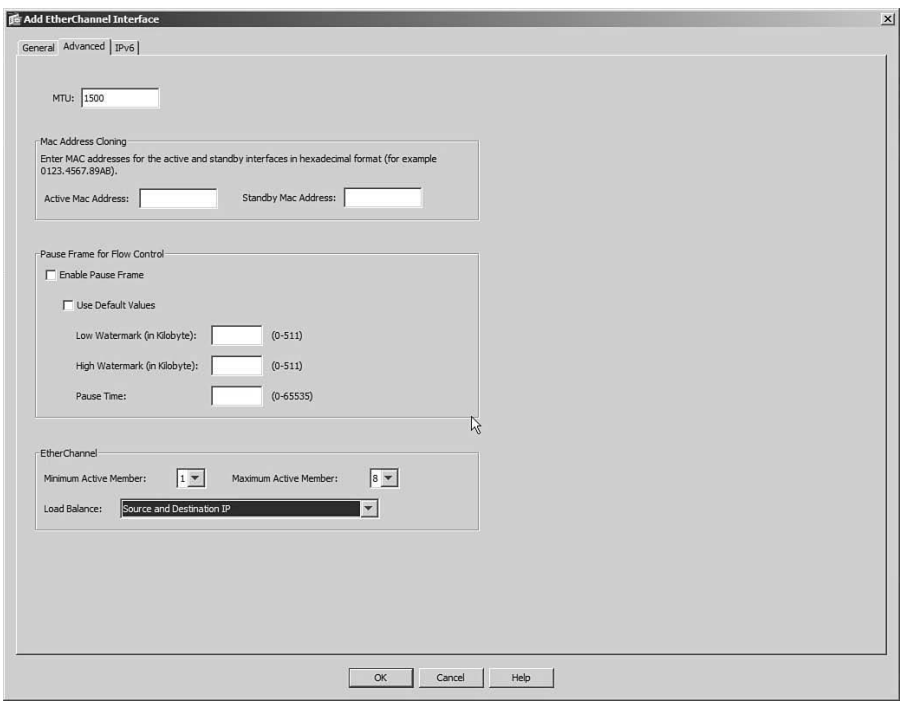


Figure 3-8 *Configuring the EtherChannel Load-Balancing Method*

Under the General tab of the Edit Interface screen, make sure that the **Enable Interface** check box under the Channel Group is selected. Select the **Advanced** tab and use the EtherChannel drop-down menu to set the negotiation mode, which can be either **Active**, **Passive**, or **On**, as shown in Figure 3-10.

You can configure more interfaces in the channel group *number* than are allowed to be active in the channel. This prepares extra standby interfaces to replace failed active ones. Set a lower LACP port priority (1 to 65,535; default 32,768) for any interfaces that must be active and a higher priority for interfaces that might be held in the standby state. Otherwise, just use the default scenario, in which all ports default to 32,768, and the lower port numbers (in interface number order) are used to select the active ports.

By default, an ASA uses LACP system priority of 32,768. If the ASA and the switch both use the same value, the one with the lower MAC address becomes the decision maker over the LACP negotiations. You can change the system priority by selecting **Configuration > Device Setup > EtherChannel**.

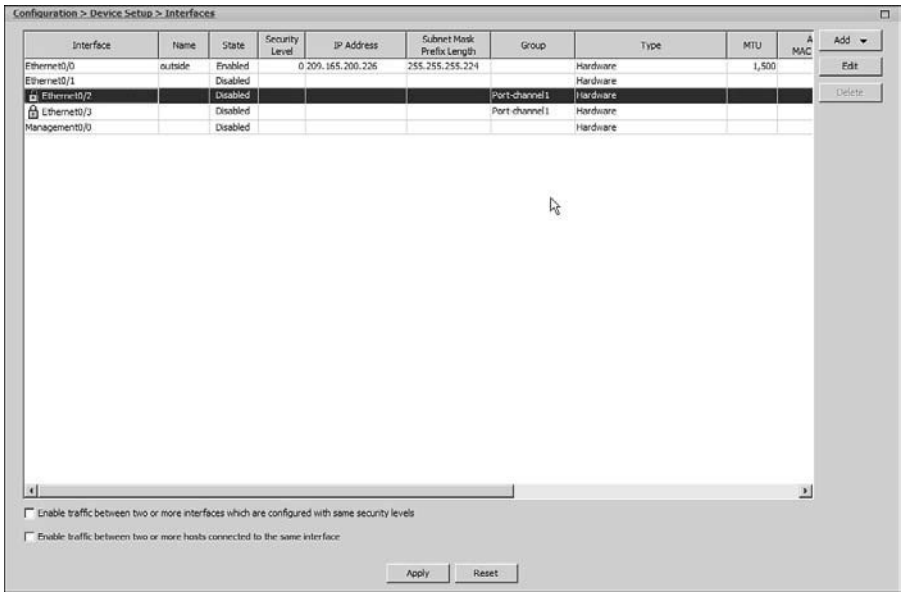


Figure 3-9 *Selecting an EtherChannel Interface for Configuration*

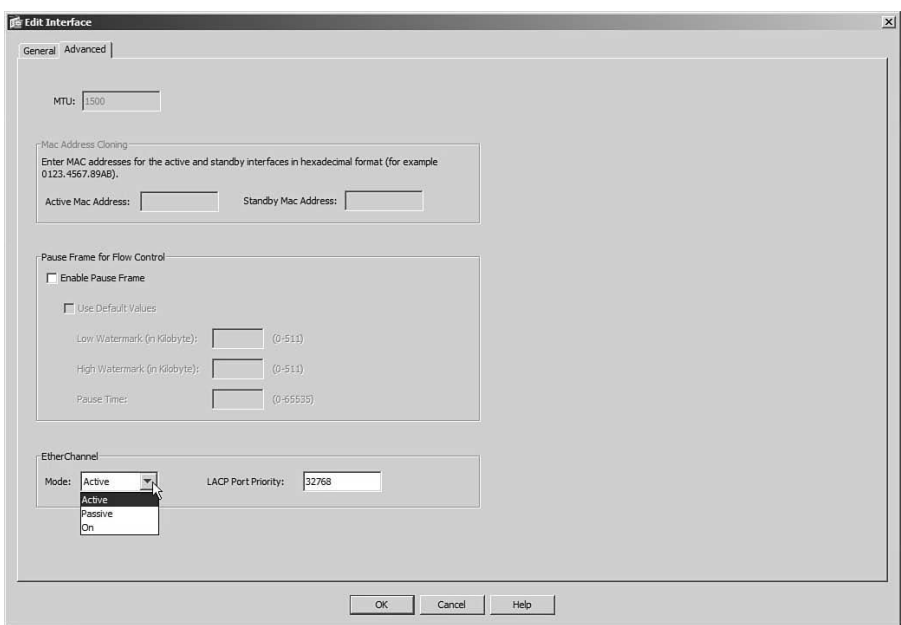


Figure 3-10 *Configuring the EtherChannel Negotiation Method*

You can also configure an EtherChannel by using the CLI. Select a physical interface that will be a member of the EtherChannel, and then identify the port-channel number where it will belong, along with the negotiation method that will be used:

```
ciscoasa(config)# lacp system-priority priority
ciscoasa(config)# interface type mod/num
ciscoasa(config-if)# channel-protocol lacp
ciscoasa(config-if)# channel-group number mode {on | passive | active}
ciscoasa(config-if)# lacp port-priority priority
```

As an example of LACP configuration, suppose that you want to configure an ASA to actively negotiate an EtherChannel using interfaces Ethernet0/2 and 0/3. You can use the commands listed in Example 3-7 to accomplish this.

Example 3-7 *Configuring an EtherChannel Using the CLI*

```
CISCOASA(config)# interface ethernet0/2
CISCOASA(config-if)# channel-protocol lacp
CISCOASA(config-if)# channel-group 1 mode active
CISCOASA(config-if)# exit
CISCOASA(config)# interface ethernet0/3
CISCOASA(config-if)# channel-protocol lacp
CISCOASA(config-if)# channel-group 1 mode active
CISCOASA(config-if)# exit
```

If you find that an EtherChannel is having problems, remember that the entire concept is based on consistent configurations on *both* ends of the channel. You can verify the EtherChannel state with the **show port-channel summary** command. Each port in the channel is shown, along with flags indicating the port's state, as shown in Example 3-8.

Example 3-8 **show port-channel summary** *Command Output*

```
CISCOASA# show port-channel summary
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        U - in use      N - not in use, no aggregation/nameif
        M - not in use, no aggregation due to minimum links not met
        w - waiting to be aggregated
Number of channel-groups in use: 1
Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(U)            LACP    Et0/2(P)   Et0/3(P)
CISCOASA#
```

The status of the port channel shows the EtherChannel logical interface as a whole. This should show U (in use) if the channel is operational. You also can examine the status of

each interface within the channel. Notice that both of the channel interfaces have flags (P), which indicate that they are active in the port-channel.

Configuring VLAN Interfaces

A physical ASA interface can be configured to connect to multiple logical networks. To do this, the interface is configured to operate as a VLAN trunk link. On ASA 5510 and higher platforms, each VLAN that is carried over the trunk link terminates on a unique subinterface of a physical interface. On an ASA 5505, each VLAN is defined by a unique VLAN interface and can connect to physical interfaces and be carried over a VLAN trunk link.

Key Topic

VLAN Interfaces and Trunks on ASA 5510 and Higher Platforms

An ASA trunk link supports only the IEEE 802.1Q trunk encapsulation method. As each packet is sent over a trunk link, it is tagged with its source VLAN number. As packets are removed from the trunk, the tag is examined and removed so that the packets can be forwarded to their appropriate VLANs. Figure 3-11 shows how a trunk link between an ASA and a switch can encapsulate or carry frames from multiple VLANs.

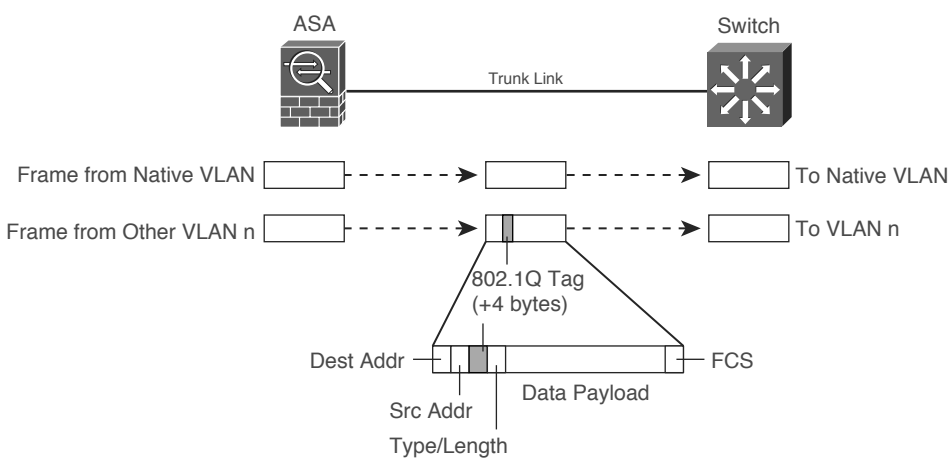


Figure 3-11 *IEEE 802.1Q Trunk Link Operation with an ASA*

IEEE 802.1Q trunk links support the concept of a native VLAN. Frames coming from the native VLAN are sent over the trunk link without a tag, while frames from other VLANs have a tag added while in the trunk. By default, only packets that are sent out the ASA's physical interface itself are not tagged, and they appear to use the trunk's native VLAN. Packets that are sent out a subinterface do receive a VLAN tag.

Note: Although a Cisco switch can be configured to negotiate the trunk status or encapsulation through the Dynamic Trunking Protocol (DTP), ASA platforms cannot. Therefore, an ASA trunk link is either on or off, according to the subinterface configuration. You should make sure that the switch port is configured to trunk unconditionally, too.

You can configure a trunk link by using the following configuration commands:

```
ciscoasa(config)# interface hardware_id.subinterface
ciscoasa(config-subif)# vlan vlan_id
```

First, use the **interface** command to identify the physical interface that will become a trunk link and the subinterface that will be associated with a VLAN number. The physical interface is given as *hardware_id*, such as Ethernet0/3, followed by a dot or period. A subinterface number is added to the physical interface name to create the logical VLAN interface. This is an arbitrary number that must be unique for each logical interface.

Use the **vlan** *vlan_id* subinterface configuration command to specify the VLAN number. The subinterface number does not have to match the VLAN number, although it can for convenience and readability.

As an example, Figure 3-12 shows a network diagram of a trunk link between an ASA and a switch. ASA physical interface Ethernet0/3 is used as the trunk link. VLAN 10 is carried over ASA subinterface Ethernet0/3.1, while VLAN 20 is carried over Ethernet0/3.2. The trunk link can be configured with the commands listed in Example 3-9.

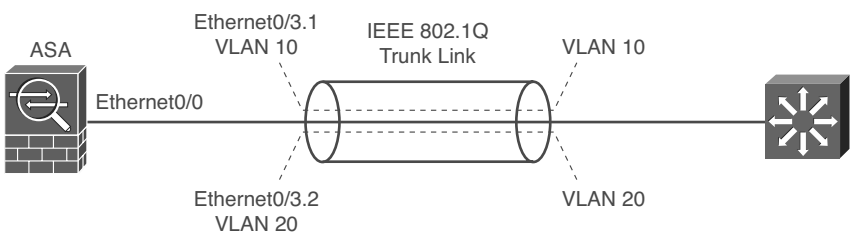


Figure 3-12 *Network Diagram for Example 3-9 Trunk Link Configuration*

Example 3-9 *Configuring a Trunk Link on an ASA*

```
ciscoasa(config)# interface ethernet0/3
ciscoasa(config-if)# no shutdown
ciscoasa(config-if)# interface ethernet0/3.1
ciscoasa(config-subif)# vlan 10
ciscoasa(config-subif)# no shutdown
ciscoasa(config-subif)# interface ethernet0/3.2
ciscoasa(config-subif)# vlan 20
ciscoasa(config-subif)# no shutdown
```

The same trunk link configuration can be accomplished with ASDM. Subinterfaces used in a trunk link must first be added or created. In the interface list view, select the **Add > Interface** function in the upper-right corner of the ASDM application. Select the hardware port or physical interface that will be used for the trunk link. In Figure 3-13, Ethernet0/3 is used. Because subinterface Ethernet0/3.1 is being created, the subinterface ID is set to 1. The VLAN ID is set to 10.

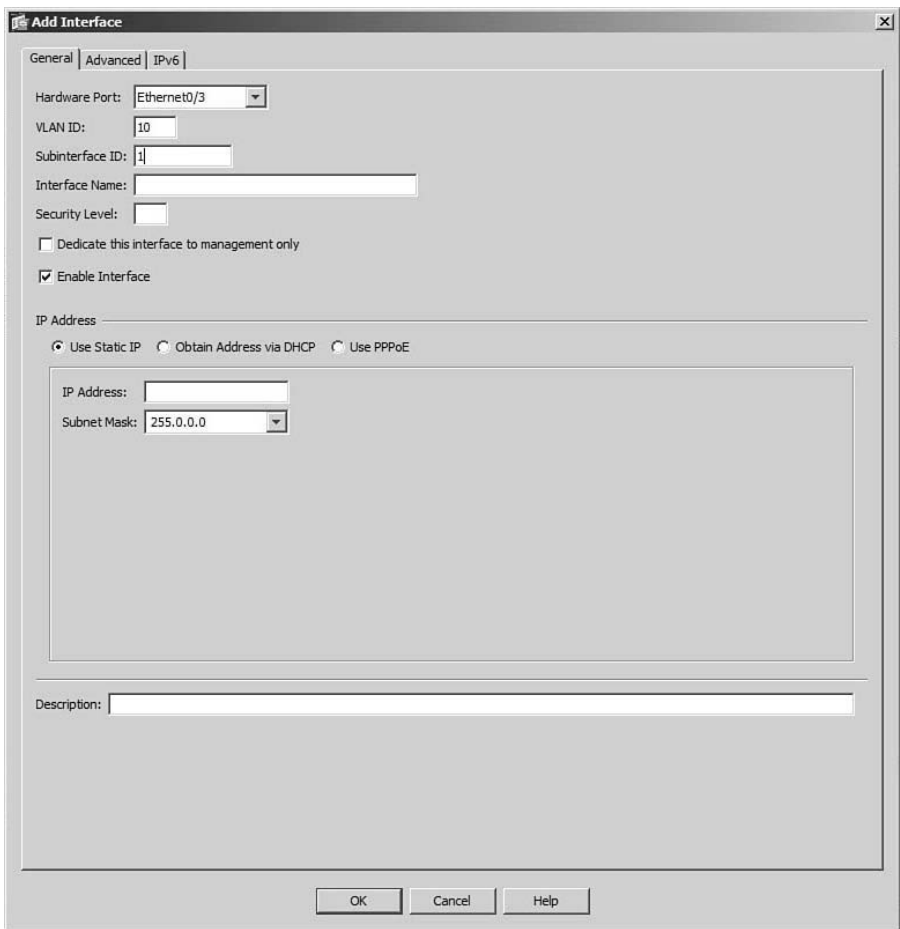


Figure 3-13 *Configuring a Trunk Link in ASDM*

Note: Other parameters, such as the interface name, security level, and IP address, should be configured, too. These are discussed in the section, "Configuring Interface Security Parameters."

VLAN Interfaces and Trunks on an ASA 5505

On an ASA 5505, VLANs are supported on the physical interfaces, but only if corresponding logical VLAN interfaces are configured. For example, if VLAN 1 is to be used, the **interface vlan 1** command must be entered to create the internal VLAN and the VLAN interface.

By default, the ASA 5505 platform includes the **interface vlan 1** and **interface vlan 2** commands in its configuration.

Other parameters, such as the interface name, security level, and IP address, should be configured on VLAN interfaces rather than on physical interfaces. These are discussed in the section, "Configuring Interface Security Parameters."

If you need to carry multiple VLANs over a link to a neighboring switch, you can configure an ASA 5505 physical interface as a VLAN trunk link. First, create the individual VLANs with the **interface vlan** *vlan-id* configuration command. Then, configure the physical interface to operate in IEEE 802.1Q trunk mode and allow specific VLANs to be carried over it with the following interface configuration commands:

```
ciscoasa(config-if)# switchport mode trunk
ciscoasa(config-if)# switchport trunk allowed vlan vlan-list
```

By default, no VLANs are permitted to be carried over a trunk link. You must identify which VLANs can be carried by entering *vlan-list*, which is a comma-separated list of VLAN numbers. In Example 3-10, an ASA 5505 is configured to support VLANs 10 and 20 and carry those VLANs over interface Ethernet0/5, which is configured as a trunk link.

Example 3-10 *ASA VLAN CLI Configuration*

```
ciscoasa(config)# interface vlan 10
ciscoasa(config-if)# exit
ciscoasa(config)# interface vlan 20
ciscoasa(config-if)# exit
ciscoasa(config)# interface ethernet0/5
ciscoasa(config-if)# switchport mode trunk
ciscoasa(config-if)# switchport trunk allowed vlan 10,20
```

Configuring Interface Security Parameters

Once you identify an ASA interface that will be connected to the network, you will need to apply the following three security parameters to it:

- Interface name
- IP address
- Security level

These parameters are explained in the following sections.

Naming the Interface

ASA interfaces are known by two different names:

- **Hardware name:** Specifies the interface type, hardware module, and port number. The hardware names of physical interfaces can include Ethernet0/0, Management0/0, and GigabitEthernet1/0. Hardware names of VLAN interfaces have a subinterface suffix, such as Ethernet0/0.1. Hardware names are predefined and cannot be changed.
- **Interface name:** Specifies the function of the interface, relative to its security posture. For example, an interface that faces the outside, untrusted world might be

named "outside," whereas an interface that faces the inside, trusted network might be named "inside." Interface names are arbitrary. An ASA uses the interface name when security policies are applied.

To assign an interface name to an ASA interface, you must first enter the interface configuration mode. Then, you can define the interface hardware name with the following interface configuration command:

```
ciscoasa(config-if)# nameif if_name
```

In Example 3-11, interface Ethernet0/0 is configured with the interface name "outside."

Example 3-11 *Assigning an Interface Name*

```
ciscoasa(config)# interface ethernet0/0
ciscoasa(config-if)# nameif outside
```

You can set the interface name in ASDM by editing an existing interface or adding a new interface. The interface name is set by entering the name into the Interface Name field.

Assigning an IP Address

To communicate with other devices on a network, an ASA interface needs its own IP address. (The only exception is when the ASA is configured to operate in transparent mode. This mode is covered in Chapter 12, "Using Transparent Firewall Mode.")

You can use the following interface configuration command to assign a static IP address and subnet mask to an ASA interface, if one is known and available:

```
ciscoasa(config-if)# ip address ip-address [subnet-mask]
```

If you omit the *subnet-mask* parameter, the firewall assumes that a classful network (Class A, B, or C) is being used. For example, if the first octet of the IP address is 1 through 126 (1.0.0.0 through 126.255.255.255), a Class A subnet mask (255.0.0.0) is assumed.

If you use subnetting in your network, be sure to specify the correct subnet mask rather than the classful mask (255.0.0.0, 255.255.0.0, or 255.255.255.0) that the firewall derives from the IP address.

Continuing the process from Example 3-9, so that the outside interface is assigned IP address 192.168.254.2 with a subnet mask of 255.255.255.0, enter the following:

```
ciscoasa(config-if)# ip address 192.168.254.2 255.255.255.0
```

If the ASA is connected to a network that offers dynamic IP address assignment, you should not configure a static IP address on the interface. Instead, you can configure the ASA to request an IP address through DHCP or PPPoE. Only DHCP is covered in the FIREWALL course and exam.

You can use the following interface configuration command to force the interface to request its IP address from a DHCP server:

```
ciscoasa(config-if)# ip address dhcp [setroute]
```

Adding the **setroute** keyword causes the ASA to set its default route automatically, based on the default gateway parameter that is returned in the DHCP reply. This is handy because the default route should always correlate with the IP address that is given to the interface. If the **setroute** keyword is not entered, you will have to explicitly configure a default route.

Once the ASA obtains an IP address for the interface via DHCP, you can release and renew the DHCP lease by re-entering the **ip address dhcp** command.

You can set a static interface IP address in ASDM by editing an existing interface or adding a new one. First, select **Use Static IP** in the IP Address section, as shown previously in Figure 3-13, and then enter the IP address. For the subnet mask, you can type in a mask or select one from a drop-down menu.

If the interface requests an IP address through DHCP, select the **Obtain Address via DHCP** option. By default, the ASA will use the interface MAC address in the DHCP request. To get a default gateway automatically through DHCP, check the **Obtain Default Route Through DHCP** check box. You can click the **Renew DHCP Lease** button at any time to release and renew the DHCP lease.

Setting the Security Level

ASA platforms have some inherent security policies that are based on the relative trust or security level that has been assigned to each interface. Interfaces with a higher security level are considered to be more trusted than interfaces with a lower security level. The security levels can range from 0 (the least amount of trust) to 100 (the greatest amount of trust).

Usually, the "outside" interface that faces a public, untrusted network should receive security level 0. The "inside" interface that faces the community of trusted users should receive security level 100. Any other ASA interfaces that connect to other areas of the network should receive a security level between 1 and 99. Figure 3-14 shows a typical scenario with an ASA and three interfaces.

By default, interface security levels must be unique so that the ASA can apply security policies across security-level boundaries. This is because of the two following inherent policies that an ASA uses to forward traffic between its interfaces:

- Traffic is allowed to flow from a higher-security interface to a lower-security interface (inside to outside, for example), provided that any access list, stateful inspection, and address translation requirements are met.
- Traffic from a lower-security interface to a higher one cannot pass unless additional explicit inspection and filtering checks are passed.

This concept is shown in Figure 3-15, applied to an ASA with only two interfaces.

In addition, the same two security policies apply to any number of interfaces. Figure 3-16 shows an ASA with three different interfaces and how traffic is inherently permitted to flow from higher-security interfaces toward lower-security interfaces. For example, traffic coming from the inside network (security level 100) can flow toward the DMZ network (security level 50) because the security levels are decreasing. As well, DMZ traffic (security level 50) can flow toward the outside network (security level 0).

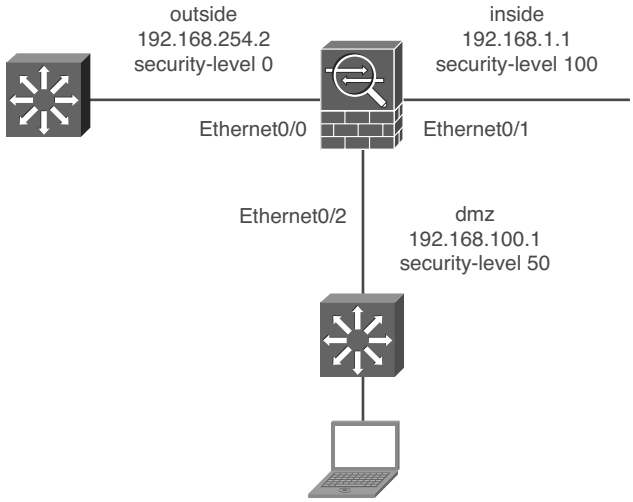


Figure 3-14 *Example ASA with Interface Names and Unique Security Levels*

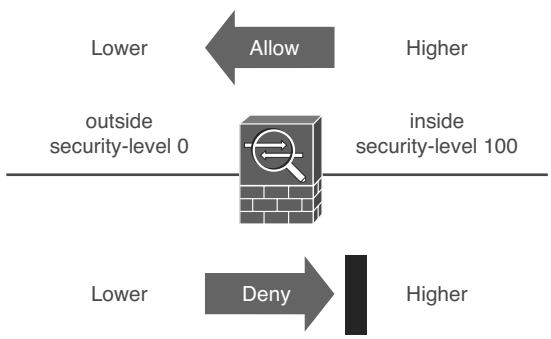


Figure 3-15 *Inherent Security Policies Between ASA Interfaces*

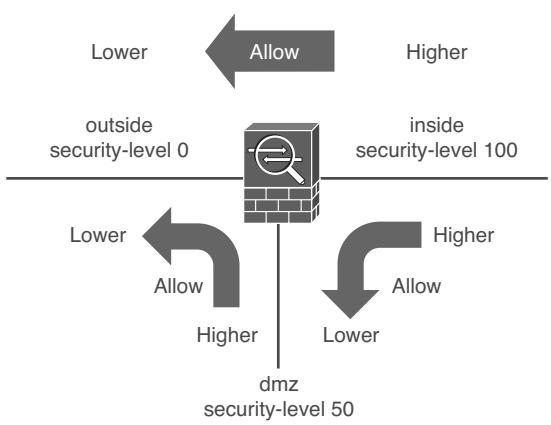


Figure 3-16 *Traffic Flows Are Permitted from Higher to Lower Security Levels*

Traffic that is initiated in the opposite direction, from a lower security level toward a higher one, cannot pass so easily. Figure 3-17 shows the same ASA with three interfaces and the possible traffic flow patterns.

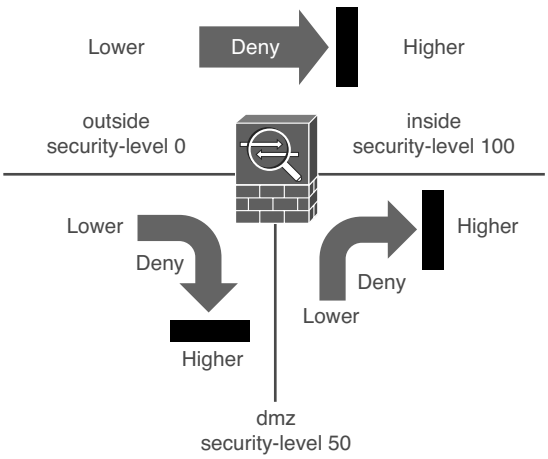


Figure 3-17 *Traffic Flows Are Blocked from Lower to Higher Security Levels*

You can assign a security level of 0 to 100 to an ASA interface with the following interface configuration command:

```
ciscoasa(config-if)# security-level level
```

From ASDM, you can set the security level when you edit an existing interface or add a new one.

Continuing from the configuration in the section, "Assigning an IP Address," you can assign the outside interface with a security level of 0 by entering the following:

```
ciscoasa(config-if)# security-level 0
```

By default, interface security levels do not have to be unique on an ASA. However, if two interfaces have the same security level, the default security policy will not permit any traffic to pass between the two interfaces at all. You can override this behavior with the **same-security-traffic permit inter-interface** command.

In addition, there are two cases in which it is not possible to assign unique security levels to each ASA interface:

- **The number of ASA interfaces is greater than the number of unique security level values:** Because the security level can range from 0 to 100, there are 101 unique values. Some ASA platforms can support more than 101 VLAN interfaces, so it becomes impossible to give them all unique security levels. In this case, you can use the following command in global configuration mode so that you can reuse security level numbers and relax the security level constraint *between* interfaces, as shown in the left portion of Figure 3-18:

  ```
  ciscoasa(config)# same-security-traffic permit inter-interface
  ```

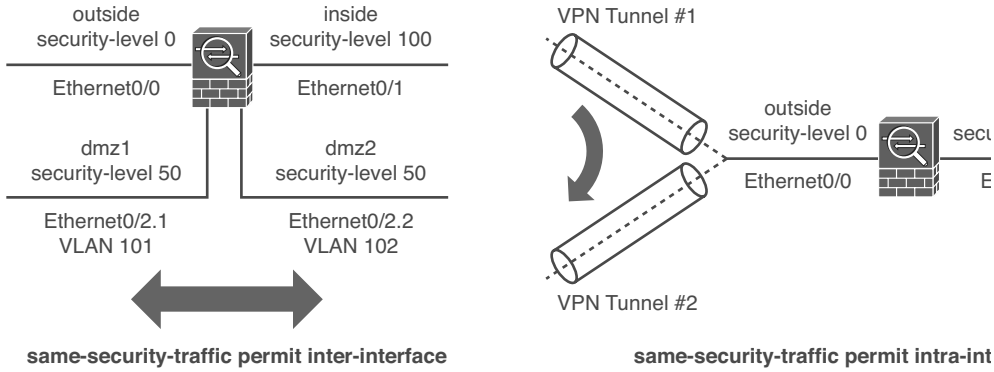


Figure 3-18 *Permitting Traffic to Flow Across the Same Security Levels*

- **Traffic must enter and exit through the same interface, traversing the same security level:** When an ASA is configured to support logical VPN connections, multiple connections might terminate on the same ASA interface. This VPN architecture looks much like the spokes of a wheel, where the ASA interface is at the hub or center. When traffic comes from one VPN spoke and enters another spoke, it essentially enters the ASA interface and comes out of one VPN connection, only to enter a different VPN connection and go back out the same interface. In effect, the VPN traffic follows a hairpin turn on a single interface.

  If an ASA is configured for VPN connections, you can use the following command in global configuration mode to relax the security level constraint *within* an interface, as shown in the right portion of Figure 3-18:

  ```
  ciscoasa(config)# same-security-traffic permit intra-interface
  ```

If you are using ASDM, you can accomplish the same tasks from the **Configuration > Device Setup > Interfaces** using the two check boxes at the bottom of the interface list, as illustrated in Figure 3-19.

Interface Security Parameters Example

The ASA in Figure 3-14 has three interfaces. Example 3-12 shows the commands that can be used to configure each of the interfaces with the necessary security parameters.

Example 3-12 *Configuring the ASA Interfaces from Figure 3-14*

```
ciscoasa(config)# interface ethernet0/0
ciscoasa(config-if)# nameif outside
ciscoasa(config-if)# ip address 192.168.254.2 255.255.255.0
ciscoasa(config-if)# security-level 0
ciscoasa(config-if)# interface ethernet0/1
ciscoasa(config-if)# nameif inside
ciscoasa(config-if)# ip address 192.168.1.1 255.255.255.0
ciscoasa(config-if)# security-level 100
ciscoasa(config-if)# interface ethernet0/2
ciscoasa(config-if)# nameif dmz
ciscoasa(config-if)# ip address 192.168.100.1 255.255.255.0
ciscoasa(config-if)# security-level 50
```

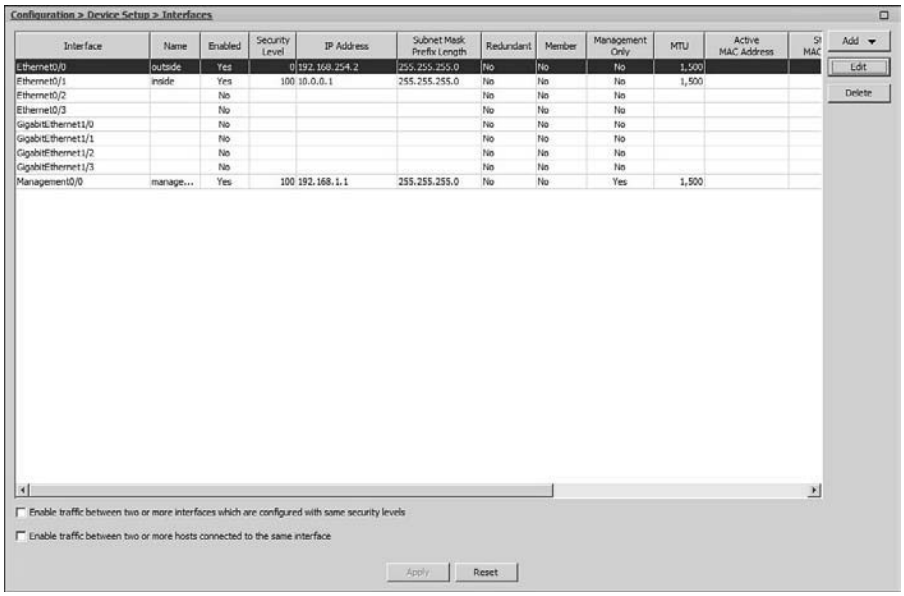


Figure 3-19 *Check Boxes to Permit Traffic to Traverse the Same Security Levels*

As a comparison, Figure 3-20 shows the same outside interface configuration done in ASDM.

Configuring the Interface MTU

By default, any Ethernet interface has its maximum transmission unit (MTU) size set to 1500 bytes, which is the maximum and expected value for Ethernet frames. If a packet is larger than the MTU, it must be fragmented before being transmitted. And before the packet can be presented at the destination, all of its fragments must be reassembled in their proper order.

The whole fragmentation and reassembly process takes time, memory, and CPU resources, so it should be avoided if possible. Normally, the default 1500-byte MTU is sufficient because Ethernet frames are limited to a standard maximum of 1500 bytes of payload data. Various IEEE standards use expanded frame sizes to carry additional information. As well, data centers often leverage Ethernet “giant” or “jumbo” frames, which are much larger than normal, to move large amounts of data efficiently.

If packets larger than 1500 bytes are commonplace in a network, you can increase the MTU size to prevent the packets from being fragmented at all. In some cases, you might need to reduce the MTU to avoid having to fragment encrypted packets where the encryption protocols add too much overhead to an already maximum-sized packet. Ideally, the MTU should be increased on every network device and interface along the entire data path.

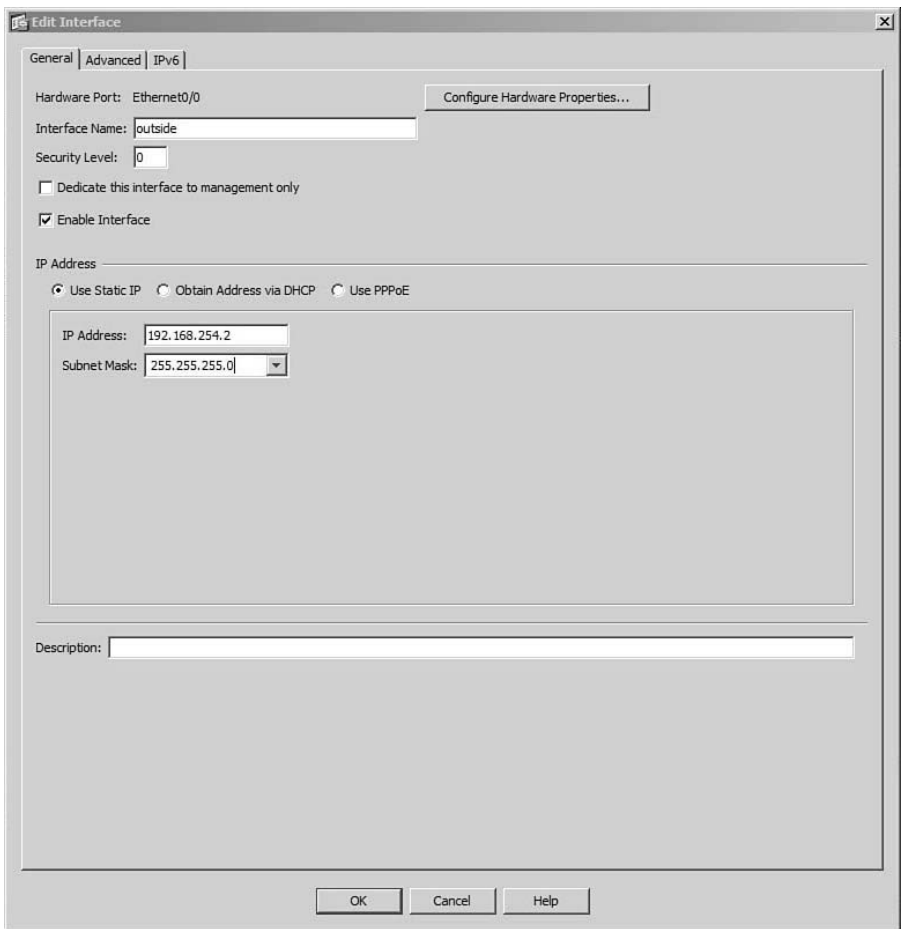


Figure 3-20 *Configuring the Outside ASA Interface*

To adjust the interface MTU from ASDM, first select **Configuration > Device Setup > Interfaces**, select an interface, and click the **Edit** button. Next, select the **Advanced** tab and enter the new MTU value, as shown in Figure 3-21. Although ASDM lets you type a new value, it won't permit the value to change if the interface has not been configured with a name.

To accomplish the same task from the CLI, you can use the following global configuration command to adjust the MTU on an ASA interface:

```
ciscoasa(config)# mtu if_name bytes
```

Identify the interface using its name, such as "inside" or "outside," rather than the hardware name. The transmitted MTU can be sized from 64 to 9216 bytes.

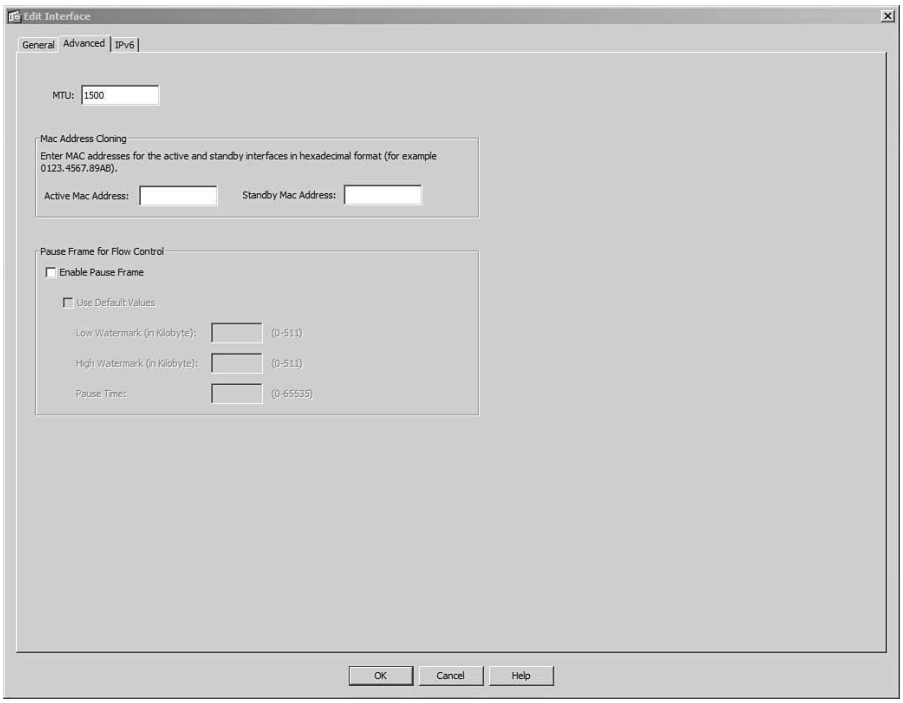


Figure 3-21 *Configuring an Interface MTU in ASDM*

You should also use the following interface configuration command to enable jumbo frame processing as frames are received on an interface:

```
ciscoasa(config-if)# jumbo-frame reservation
```

Although you can increase the MTU size on any ASA platform, be aware that the **jumbo-frame reservation** command is supported only on the ASA 5585-X.

You can display the current MTU configuration for all firewall interfaces by using the **show running-config mtu** command. Interface MTU settings are also displayed as a part of the **show interface** command output. Example 3-13 shows the output from each of the commands.

Example 3-13 *Displaying the Interface MTU*

```
ciscoasa# show running-config mtu
mtu outside 1500
mtu inside 1500
ciscoasa# show interface outside
Interface Ethernet0/0 "outside", is up, line protocol is up
  Hardware is i82546GB rev03, BW 1000 Mbps, DLY 10 usec
        Auto-Duplex(Full-duplex), Auto-Speed(100 Mbps)
        Input flow control is unsupported, output flow control is unsupported
        MAC address 001a.a22d.1ddc, MTU 1500
```

```
       IP address 192.168.100.10, subnet mask 255.255.255.0
       1996 packets input, 127860 bytes, 0 no buffer
       Received 533 broadcasts, 0 runs, 0 giants
```

Verifying Interface Operation

To verify that an ASA interface is operating correctly, you can use the following command:


```
ciscoasa# show interface if_name
```

Here, you can specify either a hardware name, such as ethernet0/0, or an interface name, such as outside. The **show interface** command displays the current status, current speed and duplex mode, MAC address, IP address, and many statistics about the data being moved into and out of the interface. The command also lists traffic statistics, such as packets and bytes in the input and output directions, and traffic rates. The rates are shown as 1-minute and 5-minute averages. Example 3-14 shows a sample of the output.

Example 3-14 *Sample Output from the* **show interface** *Command*

```
ciscoasa# show interface ethernet0/0
Interface Ethernet0/0 "outside", is up, line protocol is up
  Hardware is i82546GB rev03, BW 1000 Mbps, DLY 10 usec
        Auto-Duplex(Full-duplex), Auto-Speed(100 Mbps)
        Input flow control is unsupported, output flow control is unsupported
        MAC address 001a.a22d.1ddc, MTU 1500
        IP address 192.168.254.2, subnet mask 255.255.255.0
        26722691 packets input, 27145573880 bytes, 0 no buffer
        Received 62291 broadcasts, 0 runs, 0 giants
        0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
        0 pause input, 0 resume input
        0 L2 decode drops
        19039166 packets output, 5820422387 bytes, 0 underruns
        0 output errors, 0 collisions, 0 interface resets
        0 late collisions, 0 deferred
        0 input reset drops, 0 output reset drops
        0 rate limit drops
        input queue (blocks free curr/low): hardware (255/253)
        output queue (blocks free curr/low): hardware (255/255)
  Traffic Statistics for "outside":
        26722691 packets input, 27145573880 bytes
        19039166 packets output, 5820422387 bytes
        49550 packets dropped
      1 minute input rate 16 pkts/sec,  16110 bytes/sec
      1 minute output rate 17 pkts/sec,  16240 bytes/sec
      1 minute drop rate, 0 pkts/sec
      5 minute input rate 12 pkts/sec,  13867 bytes/sec
```

```
     5 minute output rate 15 pkts/sec,  15311 bytes/sec
     5 minute drop rate, 0 pkts/sec
ciscoasa#
```

You can verify the interface status in the second line of output. If the interface is shown as "up," the interface has been enabled. If the line protocol is shown as "up," there is an active link between the ASA interface and some other device.

To display a summary of all ASA interfaces and their IP addresses and current status, you can use the **show interface ip brief** command, as shown in Example 3-15.

Example 3-15 *Sample Output from the* **show interface ip brief** *Command*

```
ciscoasa# show interface ip brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0/0                192.168.254.2   YES manual up                    up
Ethernet0/1                10.0.0.1        YES manual up                    up
Ethernet0/2                unassigned      YES unset  administratively down down
Ethernet0/3                unassigned      YES unset  administratively down down
Internal-Data0/0           unassigned      YES unset  administratively down up
Management0/0              192.168.1.1     YES manual up                    up
GigabitEthernet1/0         unassigned      YES unset  administratively down down
GigabitEthernet1/1         unassigned      YES unset  administratively down down
GigabitEthernet1/2         unassigned      YES unset  administratively down down
GigabitEthernet1/3         unassigned      YES unset  administratively down down
Internal-Data1/0           unassigned      YES unset  up                    up
ciscoasa#
```

You can monitor the redundant interface status with the following command:

```
ciscoasa# show interface redundant number
```

Example 3-16 shows the output for interface redundant 1. Notice that physical interface Ethernet0/0 is currently the active interface, while Ethernet0/1 is not. The output also reveals the date and time of the last switchover.

Example 3-16 *Verifying the Status of a Redundant Interface*

```
ciscoasa# show interface redundant 1
Interface Redundant1 "inside", is up, line protocol is up
  Hardware is i82546GB rev03, BW 100 Mbps, DLY 1000 usec
        Auto-Duplex(Full-duplex), Auto-Speed(100 Mbps)
        MAC address 0016.c789.c8a5, MTU 1500

[output omitted for clarity]
```

```
  Redundancy Information:
        Member Ethernet0/0(Active), Ethernet0/1
        Last switchover at 01:32:27 EDT Sep 24 2010
ciscoasa#
```

Exam Preparation Tasks

As mentioned in the section, "How to Use This Book," in the Introduction, you have a couple of choices for exam preparation: the exercises here, Chapter 17, "Final Preparation," and the exam simulation questions on the CD-ROM.

Review All Key Topics

Review the most important topics from inside the chapter, noted with the Key Topics icon in the outer margin of the page. Table 3-3 lists a reference of these key topics and the page numbers on which each is found.

Table 3-3 *Key Topics for Chapter 3*

Key Topic Element	Description	Page Number
Paragraph	Discusses physical interface configuration	83
Paragraph	Explains redundant interfaces	85
Paragraph	Describes EtherChannel negotiation with LACP	89
Paragraph	Explains how to configure a trunk link	95
Paragraph	Explains how to configure VLAN interfaces on an ASA 5505	97
List	Describes the three necessary interface security parameters	98
Paragraph	Describes how to display interface status information and statistics	107

Define Key Terms

Define the following key terms from this chapter and check your answers in the glossary:

hardware name, interface name, security level, physical interface, redundant interface, member interface, EtherChannel, LACP, VLAN interface, VLAN trunk link, MTU

Command Reference to Check Your Memory

This section includes the most important configuration and EXEC commands covered in this chapter. It might not be necessary to memorize the complete syntax of every command, but you should be able to remember the basic keywords that are needed.

To test your memory of the commands, cover the right side of Table 3-4 with a piece of paper, read the description on the left side, and then see how much of the command you can remember.

The FIREWALL exam focuses on practical, hands-on skills that are used by a networking professional. Therefore, you should be able to identify the commands needed to configure and test an ASA feature.

Table 3-4 *Commands Related to ASA Interface Configuration and Verification*

Task	Command Syntax
List physical interfaces	ciscoasa# **show version**
List interfaces that have a name and security level	ciscoasa# **show nameif**
List ASA 5505 interfaces and VLAN mapping	ciscoasa# **show switch vlan**
Configure the speed, duplex mode, and state of a physical interface	ciscoasa(config)# **interface** *hardware-id* ciscoasa(config-if)# **speed** {**auto** | **10** | **100** | **1000**} ciscoasa(config-if)# **duplex** {**auto** | **full** | **half**} ciscoasa(config-if)# [**no**] **shutdown**
Map an ASA 5505 physical interface to a VLAN	ciscoasa(config-if)# **switchport access vlan** *vlan-id*
Define a redundant interface and its member interfaces	ciscoasa(config)# **interface redundant** *number* ciscoasa(config-int)# **member-interface** *physical_interface* ciscoasa(config-if)# [**no**] **shutdown**
Set the LACP system priority	ciscoasa(config)# **lacp system-priority-** *priority*
Configure a physical interface to become a member of an EtherChannel	ciscoasa(config)# **interface** *type mod/num* ciscoasa(config-if)# **channel-protocol lacp** ciscoasa(config-if)# **channel-group** *number* **mode** {**on** |**passive** |**active**} ciscoasa(config-if)# **lacp port-priority** *priority*
Define a physical subinterface that is mapped to a VLAN number	ciscoasa(config)# **interface** *hardware_id.subinterface* ciscoasa(config-subif)# **vlan** *vlan_id*
Configure an ASA 5505 VLAN interface	ciscoasa(config)# **interface vlan** *vlan-id*
Assign an interface name	ciscoasa(config-if)# **nameif** *if_name*

Table 3-4 *Commands Related to ASA Interface Configuration and Verification*

Task	Command Syntax
Assign an IP address to an interface	ciscoasa(config-if)# **ip address** *ip-address* [*subnet-mask*]
Configure an interface to request an IP address from a DHCP server	ciscoasa(config-if)# **ip address dhcp** [**setroute**]
Assign a security level to an interface	ciscoasa(config-if)# **security-level** *level*
Allow traffic to pass between interfaces with the same security level, either across two interfaces or across logical interfaces within a single physical interface, respectively	ciscoasa(config)# **same-security-traffic permit inter-interface** ciscoasa(config)# **same-security-traffic permit intra-interface**
Set the interface MTU size	ciscoasa(config)# **mtu** *if_name bytes*
Allow jumbo Ethernet frames on an ASA 5580	ciscoasa(config-if)# **jumbo-frame reservation**
Display interface details	ciscoasa# **show interface** *if_name*
Display the status of a redundant interface	ciscoasa# **show interface redundant** *number*
Display interfaces and their IP addresses and status	ciscoasa# **show interface ip brief**
Display a summary status of an EtherChannel and its member interfaces	ciscoasa# **show port-channel summary**

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