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SECURITY

Cisco ASA

All-in-One Firewall, IPS, and VPN Adaptive Security Appliance

Third Edition

Jazib Frahim, CCIE® No. 5459
Omar Santos

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Cisco ASA

All-in-One Next-Generation Firewall, IPS, and VPN Services, Third Edition

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Jazib holds a bachelor's degree in computer engineering from Illinois Institute of Technology and a master's degree in business administration (MBA) from North Carolina State University.

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- *Cisco ASA: All-in-One Firewall, IPS, and VPN Adaptive Security Appliance*
- *Cisco ASA: All-in-One Firewall, IPS, Anti-X, and VPN Adaptive Security Appliance,* Second Edition
- *Cisco Network Admission Control, Volume II: NAC Deployment and Troubleshooting*
- *SSL Remote Access VPNs*

Omar Santos is a Senior Incident Manager of Cisco's Product Security Incident Response Team (PSIRT), where he mentors and leads engineers and incident managers during the investigation and resolution of security vulnerabilities in all Cisco products. Omar has designed, implemented, and supported numerous secure networks for Fortune 500 companies and the U.S. government. Prior to his current role, he was a technical leader within the World Wide Security Practice and Cisco's Technical Assistance Center (TAC), where he taught, led, and mentored many engineers within both organizations.

Omar is an active member of the security community, where he leads several industry-wide initiatives and standards bodies. His active role helps businesses, academic institutions, state and local law enforcement agencies, and other participants that are dedicated to increasing the security of the critical infrastructure.

Omar has delivered numerous technical presentations at conferences and to Cisco customers and partners, as well as many C-level executive presentations to many organizations. He has authored numerous whitepapers, articles, and security configuration guidelines and best practices, and has also authored or coauthored the following Cisco Press books:

- *Cisco ASA: All-in-One Firewall, IPS, and VPN Adaptive Security Appliance*
- *Cisco ASA: All-in-One Firewall, IPS, Anti-X, and VPN Adaptive Security Appliance,* Second Edition

- *Cisco Network Admission Control, Volume II: NAC Deployment and Troubleshooting*
- *End-to-End Network Security: Defense-in-Depth*

Andrew Ossipov, CCIE No. 18483 and CISSP No. 344324, is currently a Technical Marketing Engineer at Cisco with primary concentration on firewall, intrusion prevention, and other Cisco Data Center Security solutions. With over 15 years of networking experience, Andrew previously worked with LAN switching, routing protocol, and network data storage technologies and performed academic research in the area of VoIP. At Cisco, Andrew is involved in a broad range of activities that include solving customers' technical problems of the highest complexity, architecting features and products, and defining the future direction of the product portfolio. He is an inventor and co-inventor of multiple pending cross-technology patents. Andrew received his bachelor of science in computer engineering and master of science in electrical engineering degrees from Wichita State University.

About the Technical Reviewers

Magnus Mortensen, CCIE No. 28219, has more than 10 years of network experience and has been employed at Cisco since June of 2006. During his years at Cisco, Magnus has been working with firewall and network security technologies and is currently part of the Security & NMS Technical Leadership team. Based in Research Triangle Park, North Carolina, Magnus specializes in the full breadth of firewall technologies and is one of the founding members of the Cisco TAC Security Podcast Series. Besides troubleshooting customer networks, he enjoys creating new tools and programs that help advance not only TAC, but Cisco as an organization. Originally from southern New York state, Magnus moved down to North Carolina after graduating from Rensselaer Polytechnic Institute with a bachelor's degree in computer systems engineering.

Phillip Strelau has been with Cisco Systems since 2008 and is a technical lead on the Firewall Technical Assistance Center (TAC) team. He graduated from Rochester Institute of Technology with a degree in network security and systems administration and has worked in the networking field for almost a decade. During his time at Cisco, Phillip has worked with product developers to enhance the ASA, CX, IPS, and CSM product lines. He is also active in the Cisco Certification space, helping to provide content and feedback for CCNA Security and CCNP Security, and having helped to create the Cisco Cybersecurity Specialist certification.

Dedications

Jazib Frahim:

I would like to dedicate this book to my lovely wife, Sadaf, and my two lovely and adorable children, Zayan and Zeenia, who have patiently put up with me during the writing process.

I would also like to dedicate this book to my parents, Frahim and Perveen, who support and encourage me in all my endeavors.

Finally, I would like to thank my siblings, including my brother Shazib and sisters Erum and Sana, sister-in-law Asiya, brother-in-law Faraz, my cute nephew Shayan, and my adorable nieces Shiza and Alisha. Thank you for your patience and understanding during the development of this book.

Omar Santos:

I would like to dedicate this book to my lovely wife, Jeannette, and my two beautiful children, Hannah and Derek, who have inspired and supported me throughout the development of this book.

I also dedicate this book to my father, Jose; and in memory of my mother, Generosa. Without their knowledge, wisdom, and guidance, I would not have the goals that I strive to achieve today.

Andrew Ossipov:

I dedicate this book to my parents, Liudmila and Evgeny, whose never ending love, care, and wisdom continue to be the foundation of everything that I am today and something for which I will be forever grateful. I also dedicate this to my sister, Polina, who always stays by my side and constantly humbles me by asking for advice despite being one of the smartest people that I know.

This work would not be possible without the love, support, and inspiration of my precious wife, Oksana, who put up with the long evening and weekend hours to ensure the timely completion of my chapters.

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Kudos to the Cisco ASA product development team for delivering such a great product. Their support is also greatly appreciated during the development of this book.

Finally, we would like to acknowledge the Cisco TAC. Some of the best and brightest minds in the networking industry work there, supporting our Cisco customers often under very stressful conditions and working miracles daily. They are truly unsung heroes, and we are all honored to have had the privilege of working side by side with them in the trenches of the TAC.

Contents at a Glance

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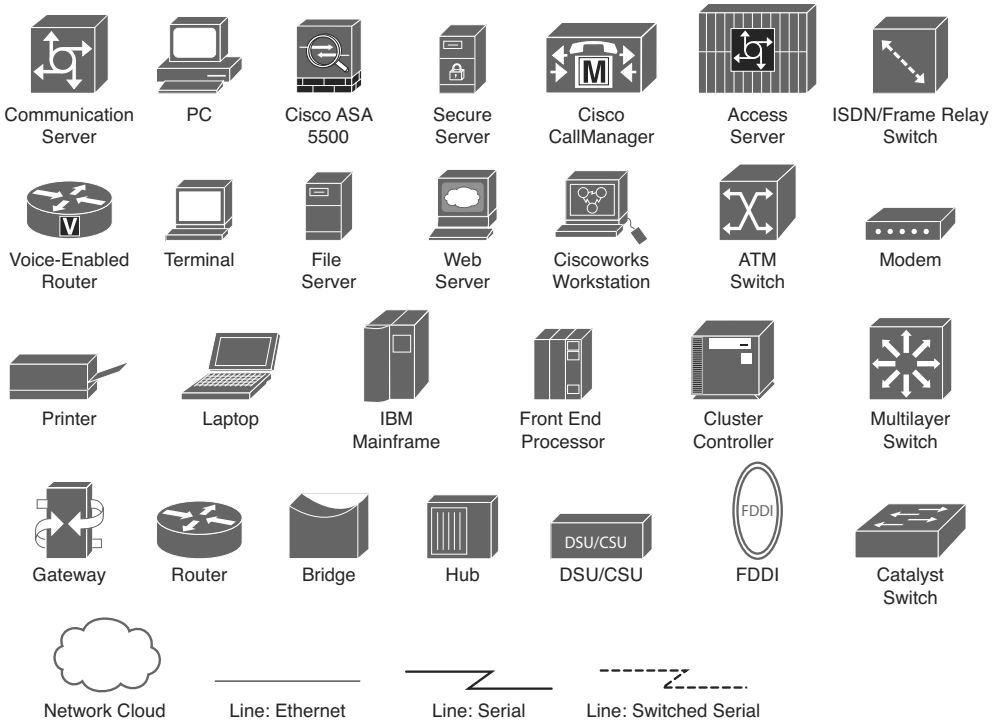

Command Syntax Conventions

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

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

Foreword

First, let me congratulate Jazib, Omar, and Andrew for producing what will be regarded as the definitive guide to maximizing the value of the Cisco Adaptive Security Appliance (ASA).

This book takes a hands-on approach to its subject and illuminates the design concepts and functionality built into the latest versions of the Cisco ASA, which allows technology organizations to secure data, services, and assets. The world has moved from IT infrastructure architectures consisting of enterprise-owned assets contained within a perimeter to a constantly changing mix of virtual, cloud, and outsourced environments. If anything, the enterprise IT security mission promises to become even more complex as the Internet of Things accelerates its expansion over the coming years.

So, if IT managers can no longer see, control, and secure the lion's share of assets for which they are responsible, what can they see, control, and secure? The network holds the answer to that question.

As the IT universe has evolved in ways beyond our imagining, the network itself has become the high ground for information security. Formerly, the only things that mattered in a network were bandwidth, availability, and cost of service. In a very real sense, the ideal network was an open, common carrier highway for all traffic—good, bad, and ugly.

Today, networks are much smarter than they used to be. They offer their operators unprecedented abilities to see, monitor, and control traffic traveling across them. The security benefits of smarter networks should go without saying at this point. The Cisco ASA leads this trend by integrating identity management, access control, intrusion prevention, and VPN services in a single system.

Technology alone, however, does not secure a network or an infrastructure. Infrastructure operators need to effectively use the tools available to them to minimize opportunities for adversaries to do harm. That's where this book comes in. It provides solid grounding in a proven strategy to get the most from the Cisco ASA.

In conclusion, knowledge is always more powerful than technology, and learning—as provided in this book—is the pathway to knowledge. This book will help you expand the efficacy of your ASA and help you gain some additional perspectives on network security.

Bryan Palma

Senior Vice President

Global Security Services

Introduction

Cyber security has always been a challenge for many organizations, especially for those that cannot deploy separate devices to provide next-generation firewall, intrusion prevention, and virtual private network (VPN) services. The Cisco ASA is a high-performance, multifunction security appliance that offers next-generation firewall, IPS, and VPN services. The Cisco ASA delivers these features through improved network integration, resiliency, and scalability.

This book is an insider's guide to planning, implementing, configuring, and troubleshooting the Cisco Adaptive Security Appliances. It delivers expert guidance from senior Cisco security engineers. It demonstrates how adaptive identification and mitigation services on the Cisco ASA provide a sophisticated network security solution to small, medium, and large organizations. This book brings together expert guidance for virtually every challenge you will face—from building basic network security policies to advanced next-generation firewall, VPN, and IPS implementations.

Who Should Read This Book?

This book serves as a guide for any network professional who manages network security or installs and configures firewalls, VPN devices, or intrusion detection/prevention systems. It encompasses topics from an introductory level to advanced topics on security and VPNs. The requirements of the reader include a basic knowledge of TCP/IP and networking.

How This Book Is Organized

This book has four parts, which provide a Cisco ASA product introduction and then focus on firewall features, intrusion prevention, and VPNs. Each part includes many sample configurations, accompanied by in-depth analyses of design scenarios. Your learning is further enhanced by a discussion of a set of debugs included in each technology. Groundbreaking features, such as next-generation firewalls, clustering, virtual firewalls, and SSL VPN, are discussed extensively.

The following is an overview of how this book is organized:

Part I, "Product Overview," includes the following chapters:

- Chapter 1, "Introduction to Security Technologies": This chapter provides an overview of different technologies that are supported by the Cisco ASA and widely used by today's network security professionals.
- Chapter 2, "Cisco ASA Product and Solution Overview": This chapter describes how the Cisco ASA incorporates features from each of these products, integrating comprehensive firewall, intrusion detection and prevention, and VPN technologies in a cost-effective, single-box format. Additionally, it provides a hardware overview of the Cisco ASA, including detailed technical specifications and installation guidelines. It also covers an overview of all the modules available for the Cisco ASA.

- Chapter 3, "Licensing": Different features in the Cisco ASA require a license. This chapter describes the available licenses for each Cisco ASA model and specific features, and explains how to install such licenses. It also covers the details about how you can configure a Cisco ASA as a licensing server to share SSL VPN licenses among a group of Cisco ASA.
- Chapter 4, "Initial Setup": A comprehensive list of initial setup tasks is included in this chapter. These tasks and procedures are intended to help network professionals to install, configure, and manage the basic features of the Cisco ASA.
- Chapter 5, "System Maintenance": This chapter contains information about how to perform system maintenance of the Cisco ASA, including system upgrades and health monitoring, and provides tips to troubleshoot hardware and data issues.
- Chapter 6, "Cisco ASA Services Module": The Cisco Catalyst 6500 Series and 7600 Series ASA Services Module (ASASM) is a scalable, high-performance blade that integrates with the Cisco Catalyst 6500 Series Switches and Cisco 7600 Series routers. It helps security administrators reduce costs and operational complexity, while allowing them to manage multiple firewalls from the same scalable switch platform. This chapter covers how to configure the Cisco ASA Services Module, as well as how to configure the Cisco Catalyst 6500 Series Switches and 7600 Series Routers to send traffic to be protected and inspected by the module.

Part II, "Firewall Technology," includes the following chapters:

- Chapter 7, "Authentication, Authorization, and Accounting (AAA) Services": The Cisco ASA supports a wide range of AAA features. This chapter provides guidelines on how to configure AAA services by defining a list of authentication methods applied to various implementations.
- Chapter 8, "Controlling Network Access: The Traditional Way": The Cisco ASA can protect one or more networks from intruders. Connections between these networks can be carefully controlled by advanced firewall capabilities, enabling you to ensure that all traffic from and to the protected networks passes only through the firewall based on the organization's security policy. This chapter shows you how to implement your organization's security policy, using the features the Cisco ASA provides.
- Chapter 9, "Implementing Next-Generation Firewall Services with ASA CX": Cisco ASA Next-Generation Firewall Services provides advanced security services including Application Visibility and Control (AVC) and Web Security Essentials (WSE). These new features provide granular application control that recognizes thousands of applications and provides context-based awareness of those applications and their users. This chapter covers the features, benefits, deployment, configuration, and troubleshooting of the Cisco ASA Next-Generation Firewall Services.

- Chapter 10, "Network Address Translation": This chapter provides details on how to configure Network Address Translation (NAT) on the Cisco ASA. It covers the different address translation types, how to configure address translation, DNS doctoring, and monitoring address translations in the Cisco ASA. NAT configuration commands and underlying infrastructure changed in Cisco ASA Software version 8.3. This chapter includes both pre-8.3 and post-8.3 configuration commands and steps.
- Chapter 11, "IPv6 Support": The Cisco ASA supports IPv6. This chapter covers the configuration and deployment of IPv6 support in the Cisco ASA.
- Chapter 12, "IP Routing": This chapter covers the different routing capabilities of the Cisco ASA.
- Chapter 13, "Application Inspection": The Cisco ASA stateful application inspection helps secure the use of applications and services in your network. This chapter describes how to use and configure application inspection.
- Chapter 14, "Virtualization": The Cisco ASA virtual firewall feature introduces the concept of operating multiple instances of firewalls (contexts) within the same hardware platform. This chapter shows how to configure and troubleshoot each of these security contexts.
- Chapter 15, "Transparent Firewalls": This chapter introduces the transparent (Layer 2) firewall model within the Cisco ASA. It explains how users can configure the Cisco ASA in transparent single mode and multiple mode while accommodating their security needs such as traffic filtering and address translation.
- Chapter 16, "High Availability": This chapter discusses the different redundancy and high availability mechanisms that the Cisco ASA provides. It covers the configuration of advanced high scalability features such as clustering. The Cisco ASA clustering feature is used to combine up to sixteen supported appliances into a single traffic processing system. Unlike in failover, each unit of an ASA cluster actively forwards transit traffic in both single and multiple-context modes. This chapter includes not only the overview and configuration, but also detailed troubleshooting procedures of all the high availability features available in the Cisco ASA.

Part III, "Intrusion Prevention System (IPS) Solutions," includes the following chapters:

- Chapter 17, "Implementing ASA Intrusion Prevention System (IPS)": Intrusion detection and prevention systems provide a level of protection beyond the firewall by securing the network against internal and external attacks and threats. This chapter describes the integration of IPS features within the Cisco ASA and provides expert guidance on how to configure the Cisco IPS software. Troubleshooting scenarios are also included to enhance learning.
- Chapter 18, "Tuning and Monitoring IPS": This chapter covers the IPS tuning process, as well as best practices on how to monitor IPS events.

Part IV, "Virtual Private Network (VPN) Solutions," includes the following chapters:

- Chapter 19, "Site-to-Site IPsec VPNs": The Cisco ASA supports IPsec VPN features that enable you to connect networks in different geographic locations. This chapter provides configuration and troubleshooting guidelines to successfully deploy site-to-site IPsec VPNs in both single- and multiple-mode firewalls.
- Chapter 20, "IPsec Remote-Access VPNs": This chapter discusses two IPsec remote-access VPN solutions (Cisco IPsec and L2TP over IPsec) that are supported on the Cisco ASA. Numerous sample configurations and troubleshooting scenarios are provided.
- Chapter 21, "Configuring and Troubleshooting PKI": This chapter begins by introducing Public Key Infrastructure (PKI) concepts. It then covers the configuration and troubleshooting of PKI in the Cisco ASA.
- Chapter 22, "Clientless Remote-Access SSL VPNs": This chapter provides details about the clientless SSL VPN functionality in Cisco ASA. It covers the Cisco Secure Desktop (CSD) solution and also discusses the Host Scan feature that is used to collect posture information about an endpoint. The dynamic access policy (DAP) feature, its usage, and detailed configuration examples are also provided. To reinforce learning, many different deployment scenarios are presented along with their configurations.
- Chapter 23, "Client-Based Remote-Access SSL VPNs": This chapter provides details about the AnyConnect SSL VPN functionality in Cisco ASA.
- Chapter 24, "IP Multicast Routing": This chapter covers the configuration and troubleshooting of multicast routing support in the Cisco ASA.
- Chapter 25, "Quality of Service": QoS is a network feature that allows you to give priority to certain types of traffic. This chapter covers how to configure, troubleshoot, and deploy the QoS features in the Cisco ASA.

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Chapter 3

Licensing

This chapter covers the following topics:

- Licensed features on ASA
- Managing licenses with activation keys
- Combined licenses in failover and clustering
- Shared Premium AnyConnect VPN licensing

ASA offers a very comprehensive feature set that helps secure networks of all shapes and sizes. To deliver the desired functionality within the available budget while allowing for future scalability, you can unlock advanced security capabilities and increase certain system capacities on demand through a flexible system of feature licenses.

Some characteristics of the hardware platform or expansion modules can enable certain feature licenses implicitly. You can also activate additional licenses permanently or for a certain duration of time. When multiple Cisco ASA devices participate in failover or clustering, some licensed capacities automatically aggregate up to the platform hardware limit to maximize your investment. Although this flexible system may seem complicated at first, it actually makes the task of customizing a Cisco ASA for your specific business needs quite easy.

Licensed Features on ASA

Every Cisco ASA platform comes with a certain number of implicitly activated features and capacities as a part of the Base License. In other words, these capabilities are fixed in the given software image for the particular hardware; you cannot selectively disable them. One example of such a feature is Active/Active failover, which is always available on all Cisco ASA 5585-X appliances. Some platforms offer the optional Security Plus license, which may unlock additional features or capacities on top of the Base License.

For example, you can increase the maximum concurrent firewall connection count on the Cisco ASA 5505 from 10,000 to 25,000 by installing a Security Plus license.

In addition to the Base and Security Plus licenses, you can activate other advanced security features individually:

- Some capabilities operate in a simple binary switch fashion whereby the license for the feature type is either enabled or disabled; once enabled, there are typically no direct restrictions on how much the feature can be used. For instance, the Botnet Traffic Filter license will allow you to protect all connections through a Cisco ASA up to the maximum limit for the platform.
- Other features may carry their own capacity limits that come in quantified tiers. An example of such a feature is the ability to configure security contexts on some Cisco ASA appliances. On the Cisco ASA 5580 platform, the Base License allows creating up to two application contexts, while several premium licenses of different tiered counts allow extending this limit up to 250 contexts in total.

Not all of the licensed features and capabilities are available on all hardware platforms. For instance, at the time of writing, the clustering feature is currently available only on Cisco ASA 5500-X, ASA 5580, and ASA 5585-X appliances. Depending on specific markets and international export regulations, some Cisco ASA models may also ship with the permanent No Payload Encryption license; this license ties to the particular hardware without the option of change or removal. The following licensed features and capacities are not available on any No Payload Encryption hardware models:

- AnyConnect Premium Peers
- AnyConnect Essentials
- Other VPN Peers
- Total VPN Peers
- Shared License
- AnyConnect for Mobile
- AnyConnect for Cisco VPN Phone
- Advanced Endpoint Assessment
- UC Phone Proxy Sessions
- Total UC Proxy Sessions
- Intercompany Media Engine

As you identify the correct feature set to take the most advantage of Cisco ASA capabilities while fully protecting your network, it helps to organize the licensed features into the following logical categories:

- **Basic platform capabilities:** Typically are relevant to all Cisco ASA deployments
- **Advanced security features:** Can satisfy specific network design goals for a particular Cisco ASA installation
- **Tiered capacity features:** Depend on the size of a projected user base and allow for future growth

These categories are discussed in turn next.

Basic Platform Capabilities

Basic licensed features define the foundation of the Cisco ASA capabilities that are common to all installations and designs, such as the following:

- Dictating the elementary characteristics of how an ASA device connects to the network
- Establishing the quantity and speed capabilities of physical and logical interfaces
- Limiting the number of protected connections and inside hosts
- Defining high-availability options
- Setting the baseline encryption algorithms that the system can use

The following licensed features fall under the category of basic platform capabilities:

- **Firewall Connections:** Cisco ASA Software limits the maximum concurrent count of all stateful connections depending on the hardware platform. This limit can only be increased with the Security Plus license on Cisco ASA 5505, ASA 5510, and ASA 5512-X appliances. The system will deny only new attempted connections above the licensed limit; there are no adverse effects for existing connections in this case.
- **Maximum Physical Interfaces:** All Cisco ASA platforms always allow you to use all of the available physical interfaces, so this feature either shows the actual number of physical interfaces on the Cisco ASA 5505 or displays Unlimited on all other platforms. There are additional platform-specific limitations on the total number of interfaces that can be configured in the system; the total limit covers physical and redundant interfaces, VLAN subinterfaces, EtherChannels, and bridge groups.
- **Maximum VLANs:** Each platform has its own limit on the maximum number of configurable VLANs. This limit can be expanded on Cisco ASA 5505, ASA 5510, and ASA 5512-X models by applying a Security Plus license. Keep in mind that you can create a larger number of subinterfaces on some ASA appliances, but this particular limit only kicks in when you actually assign the given number of subinterfaces to VLANs with the **vlan** interface command.

- **VLAN Trunk Ports:** This feature is applicable only to Cisco ASA 5505 appliances because they have the built-in Ethernet switch. With the Base License, you can configure the physical switch ports only in access mode; with the Security Plus license, you gain the ability to carry multiple VLANs on any of the Cisco ASA 5505 physical interfaces by configuring them as trunks.
- **Dual ISPs:** This feature only applies to the Cisco ASA 5505 where the Security Plus license enables it automatically. With the Base License, this platform only allows up to three configured logical interfaces, where the third interface can initiate traffic only to one of the other two; with this limitation, you cannot create a backup interface to provide external connectivity when the primary outside interface fails. When you apply the Security Plus license, the number of available logical interfaces increases to 20; you can then use floating default routes with route tracking to enable interface-level high availability across multiple ISPs.
- **10GE I/O:** This feature is only applicable to Cisco ASA 5585-X models. An SSP-10 and -20 with the Base License only allow you to configure the onboard fiber interfaces at 1-Gigabit Ethernet (GE) speed; the Security Plus license enables configuring these interfaces at 10-GE speed. This capability is always enabled on SSP-40 and -60 and on any expansion 10-GE interface modules. Although not directly related to this license, it should be noted that a Cisco ASA 5510 appliance requires the Security Plus license to configure Ethernet0/0 and Ethernet0/1 interfaces at 1-GE speed. All other models not mentioned here allow you to configure any onboard or external physical Ethernet interfaces up to the maximum supported speed.
- **Inside Hosts:** This value defines the maximum number of unique IP addresses behind the trusted interfaces that can establish concurrent connections with endpoints behind the outside interface. When operating in routed mode, the default route determines where the outside interface is; all unique endpoints behind all configured interfaces count toward the limit if the default route is not present. In transparent mode, only the interface with the fewest number of active endpoints counts toward the limit. This feature is set to Unlimited on all platforms except the Cisco ASA 5505, whose default limit of 10 can be expanded to 50 or Unlimited.
- **Failover:** The option of configuring a pair of Cisco ASA devices for high availability is available on all platforms, but it requires the Security Plus license on Cisco ASA 5505, ASA 5510, and ASA 5512-X models. Because the Cisco ASA 5505 does not support the Security Contexts feature, only Active/Standby failover is available on this platform. All other ASA models support both Active/Standby and Active/Active failover configurations.
- **Encryption-DES:** This license enables the DES algorithm for VPN, Unified Communications Proxy, and management session encryption by default on all Cisco ASA platforms. A weak encryption algorithm such as DES is frequently not acceptable to many remote endpoints that need to establish a secure session with the Cisco ASA; this license is typically not sufficient outside of basic management tasks.

- **Encryption-3DES-AES:** This license adds 3DES and AES algorithms in order to provide strong encryption capabilities for VPN, Unified Communications Proxy, and management sessions. Some features, such as VPN Load Balancing, also require this license for proper operation. Export regulations control access to this license, so it may not necessarily come pre-installed on a brand-new Cisco ASA by default. Because the availability of strong encryption ciphers in the Cisco ASA configuration requires this license, obtain and enable it right away if you plan on using any of the relevant cryptographic features.
- **Other VPN Peers:** This value defines the maximum number of concurrent IPsec site-to-site tunnels and IKEv1-based remote-access sessions that can terminate on a particular Cisco ASA platform. This capacity can extend from 10 to 25 by installing the Security Plus license on the Cisco ASA 5505; on all of the other models, the software sets this limit depending on the hardware capabilities.
- **Total VPN Peers:** This quantity defines the maximum number of any concurrent VPN sessions that can terminate on a given Cisco ASA platform. This licensed capacity is equal to the count of Other VPN Peers on all models with the exception of the Cisco ASA 5505, where it depends on the Security Plus and AnyConnect Essentials licenses.

Advanced Security Features

You can leverage advanced security features on top of the core Cisco ASA capabilities to achieve an additional level of protection or to enable more complex network designs. These features include the following capabilities:

- Applying the delivery of specialized application protocol inspection
- Extending the secure network perimeter by supporting mobile platforms
- Performing client posture validation for VPN connectivity
- Enabling real-time mitigation of malicious activity
- Delivering scalable device aggregation capabilities

The following licensed features fall into this category:

- **Intercompany Media Engine:** With this feature enabled, a Cisco ASA becomes an active participant in the Intercompany Media Engine infrastructure, where the Session Initiation Protocol (SIP) inspection engine operates with TLS proxy to authenticate and secure dynamic incoming VoIP connections. Because there is a particular platform limit on the maximum number of TLS proxy sessions, Intercompany Media Engine shares this limit with other features that rely on TLS proxy. Depending on the export restrictions, the particular license for this feature may allow either a total of 1000 TLS proxy sessions (restricted) or up to the preset

platform limit (unrestricted). After applying this license, use the **tls-proxy maximum-sessions** command to raise the configured session limit as desired. It should be noted that other Unified Communications inspection features that rely on TLS proxy may impose separate limits on the total number of encrypted sessions.

- **GTP/GPRS:** This enables the application inspection of the GPRS Tunneling Protocol (GTP), which supports general packet radio service (GPRS) data networks. Mobile service providers commonly use this feature to secure their network infrastructure. After activating the license, use the **inspect gtp** command to enable the GTP/GPRS inspection engine on applicable traffic under the service policy configuration.
- **AnyConnect for Mobile:** This license allows a Cisco ASA to accept SSL VPN connections from certain mobile devices running Apple iOS, Android, and Windows Mobile operating systems. Keep in mind that this is not a standalone feature but rather a special capability available for AnyConnect peers. As such, you can utilize this capability only when an installed AnyConnect Premium Peers or AnyConnect Essentials license allows the underlying SSL VPN session. When the session is using an AnyConnect Essentials license, mobile device posture data is only available for informational purposes. When the mobile device is one of the AnyConnect Premium Peers, you can leverage Dynamic Access Policies (DAP) to permit or deny network access for the given device based on a broad set of attributes.
- **AnyConnect for Cisco VPN Phone:** This license allows a Cisco ASA to accept VPN connections from certain hardware Cisco IP phones that provide embedded AnyConnect client capabilities. This is not a standalone feature, because it requires an AnyConnect Premium Peers license to allow the underlying VPN connection in the first place.
- **Advanced Endpoint Assessment:** With this feature enabled, ASA can actively enforce certain operational policies on third-party antivirus, antispyware, and personal firewall software packages residing on remote AnyConnect or clientless peers running Microsoft Windows, Apple OS X, and Linux operating systems. This is another add-on feature that is only available for AnyConnect Premium Peers; by default, such peers can only benefit from the basic reactive posture validation capabilities provided by Host Scan and Dynamic Access Policies.
- **Botnet Traffic Filter:** With this feature, you can detect and block inbound and outbound connections that involve known malicious hosts. A Cisco ASA dynamically updates the database of such offending endpoints from Cisco Security Intelligence Operations (SIO), which allows real-time protection even for zero-day attacks. The license enables database updates as well as the Botnet Traffic Filter configuration commands.
- **Cluster:** This feature is currently available only on Cisco ASA 5500-X, ASA 5580, and ASA 5585-X appliances. It expands the high-availability advantages of failover by allowing you to aggregate up to 16 physical appliances in exactly the same hardware configuration into a single logical device. Unlike failover, all members of a configured cluster process transit traffic concurrently while compensating for

the imperfections of external load-balancing. All devices in a cluster must have this feature enabled. The availability of the Cluster feature and the maximum supported number of cluster members depend on the particular software image version and hardware platform type.

- **IPS Module:** This feature is only applicable to Cisco ASA 5500-X appliances. It allows you to implement Cisco ASA Intrusion Prevention System (IPS) with the software package; you do not need it for Cisco ASA Next-Generation Firewall Services with the CX package. This license simply allows you to install the IPS software module on the Cisco ASA and then enable traffic redirection using the service-policy configuration; because the module runs an independent software image, it has its own feature license that you have to obtain and install separately. Hardware IPS modules on Cisco ASA 5505, ASA 5500, and ASA 5585-X appliances require no special license for installation or traffic redirection.

Tiered Capacity Features

Yet another category of licensed features allows a particular advanced functionality for a limited number of users or sessions. This flexibility allows you to provision enough premium licenses according to the specific business needs while allowing plenty of room for future growth. The typical features in this category provide firewall virtualization capabilities, Unified Communications inspection with TLS proxy, and advanced VPN connectivity. The preinstalled Base Licenses typically include a certain number of allowed sessions to take advantage of most of these features; you can obtain a separate license to enable or upgrade any of these capabilities to your desired user or session count. To keep things simple, these features come in specific capacity tiers. For instance, a Cisco ASA 5512-X with the Base License allows up to two Unified Communications (UC) Phone Proxy sessions; you can optionally obtain a license for 24, 50, 100, 250, or 500 sessions. Keep in mind that the capacity tiers cannot be stacked together. In other words, you need to obtain the UC Phone Proxy license for 250 sessions even if you intend to use only up to 150 of them; you cannot simply install a 50-session license followed by a 100-session license on the same device.

The following features belong to this category:

- **Security Contexts:** This license allows the creation of multiple virtual firewalls that can operate concurrently on the same physical ASA device. It is not available on the Cisco ASA 5505 platform or Cisco ASA 5510 and ASA 5512-X appliances with the Base License. All other platforms and license combinations allow you to configure up to two virtual application contexts by default; the specific tiered options depend on the platform and can extend up to 250 on a Cisco ASA Services Module and ASA 5585-X appliances with at least an SSP-20. Keep in mind that not all features are currently compatible with the multiple context mode even if you install the appropriate feature license.
- **UC Phone Proxy Sessions:** This value determines the maximum number of TLS proxy sessions that the UC Phone Proxy feature can use. This limit does not cover

transit VoIP connections that rely on the cleartext application inspection. Keep in mind that the number of active TLS proxy sessions may exceed the number of active VoIP endpoints, depending on their high-availability configuration. Typically, this licensed session count is equivalent to the Total UC Proxy Sessions license, which has the default value of 2 on all platforms. The Cisco ASA Services Module and ASA 5585-X appliances with at least an SSP-20 limit the maximum capacity of this feature to 5000 even with the Total UC Proxy Session license for 10,000 sessions. Refer to the description of the Intercompany Media Engine license for information about raising the default configured limit of TLS proxy sessions and determining additional session limits imposed by the export restrictions.

- **Total UC Proxy Sessions:** Similarly to UC Phone Proxy Sessions, this license establishes the maximum number of all connections that use TLS proxy to support Phone Proxy, Presence Federation Proxy, and Encrypted Voice Inspection features; this limit does not include TLS proxy sessions that relate to the Intercompany Media Engine or Mobility Advantage Proxy features. The default licensed capacity of this feature is 2 on all platforms; it can extend up to 10,000 sessions on a Cisco ASA Services Module or ASA 5585-X appliances with at least an SSP-20. Refer to the description of the Intercompany Media Engine license for information about raising the default configured limit of TLS proxy sessions and determining additional session limits imposed by export restrictions.
- **AnyConnect Premium Peers:** This value defines the maximum number of concurrent SSL VPN, Clientless SSL VPN, and IPsec IKEv1-based remote-access VPN sessions that can terminate on a particular Cisco ASA platform. This license is a prerequisite for multiple premium features that an AnyConnect Essentials license does not support. Such premium licensed features include AnyConnect for Cisco VPN Phone and Advanced Endpoint Assessment; Cisco Secure Desktop is another example. Keep in mind that the AnyConnect Premium Peers and AnyConnect Essential licenses cannot operate concurrently; even if you install both licenses on a single Cisco ASA device, only one of them stays active at any given time. You must use the **no anyconnect-essentials** command to enable the AnyConnect Premium Peers license. Although this tiered limit is separate from Other VPN Peers, the total concurrent VPN session count cannot exceed the Total VPN Peers.
- **AnyConnect Essentials:** This license allows the given number of SSL VPN and IPsec IKEv1-based remote-access VPN sessions to terminate on a particular Cisco ASA platform; it does not provide the ability to terminate Clientless SSL VPN connections. Refer to the description of the AnyConnect Premium Peers license for additional information on specific differences, concurrency implications, and overall limits that pertain to these related feature licenses.

Displaying License Information

Use the **show version** or **show activation-key** command to display the complete list of licensed features and capacities of a particular Cisco ASA device along with the activation information. Example 3-1 shows sample output of the **show activation-key**

command issued on a Cisco ASA 5525-X appliance. Notice that the count of Firewall Connections does not show up as a licensed feature; check the output of the **show resource usage** command for some of these platform capacities. However, this sample output contains several pieces of additional information: the serial number of the appliance and the remaining active time for each feature. It also lists multiple activation keys that enable the given set of features on this particular device for the specified amount of time. These activation keys enable a straightforward mechanism for adding or removing licensed features on Cisco ASA devices.

Example 3-1 *Cisco ASA License Information*

```
ciscoasa# show activation-key
Serial Number:  FCH16447Q8L
Running Permanent Activation Key: 0x380df35d 0xe451697e 0xcd509dd4 0xeea888f4
0x001bc79c
Running Timebased Activation Key: 0x493c3ecd 0xcd6458a1 0x31b5a533 0xc970a48b
0x05867295

Licensed features for this platform:
Maximum Physical Interfaces       : Unlimited      perpetual
Maximum VLANs                     : 200            perpetual
Inside Hosts                      : Unlimited      perpetual
Failover                          : Active/Active  perpetual
Encryption-DES                    : Enabled        perpetual
Encryption-3DES-AES               : Enabled        56 days
Security Contexts                 : 2              perpetual
GTP/GPRS                          : Disabled       perpetual
AnyConnect Premium Peers          : 2              perpetual
AnyConnect Essentials             : Disabled       perpetual
Other VPN Peers                   : 750            perpetual
Total VPN Peers                   : 750            perpetual
Shared License                    : Disabled       perpetual
AnyConnect for Mobile             : Disabled       perpetual
AnyConnect for Cisco VPN Phone    : Disabled       perpetual
Advanced Endpoint Assessment      : Enabled        56 days
UC Phone Proxy Sessions           : 2              perpetual
Total UC Proxy Sessions           : 2              perpetual
Botnet Traffic Filter             : Enabled        56 days
Intercompany Media Engine         : Disabled       perpetual
IPS Module                        : Disabled       perpetual
Cluster                           : Disabled       perpetual

This platform has an ASA5525 VPN Premium license.

The flash permanent activation key is the SAME as the running permanent key.
```

```
Active Timebased Activation Key:
0x493c3ecd 0xcd6458a1 0x31b5a533 0xc970a48b 0x05867295
Encryption-3DES-AES             : Enabled    56 days
Advanced Endpoint Assessment    : Enabled    56 days
Botnet Traffic Filter           : Enabled    56 days
```

Managing Licenses with Activation Keys

An activation key is an encoded bit string that defines the list of features to enable, how long the key would stay valid upon activation, and the specific serial number of a Cisco ASA device. A series of five hexadecimal numbers, as shown at the top of the output in Example 3-1, typically represents that string. Each activation key is only valid for the particular hardware platform with the specific encoded serial number. The complete set of activation keys resides in a hidden partition of the built-in flash device of a Cisco ASA; other nonvolatile internal memory structures maintain a backup copy of that information. After Cisco generates a key for a given device, you cannot separate individual features from this licensed package. You can request and apply another key with a different set of features to the same Cisco ASA device at any future point in time. All features encoded in a particular key always have the same licensed duration, so activation keys can be classified as permanent or time-based.

Permanent and Time-Based Activation Keys

Every Cisco ASA model comes with a certain set of basic features and capacities enabled by default; the Base License permanently activates these features on the particular platform. Even though these core features do not require an explicit activation key, one usually comes installed anyway. This is the permanent activation key, which never expires. Although the system does not require this key for basic operation, some advanced features, such as failover, depend on the permanent activation key in order to operate correctly. You can enable additional features without a time limit by applying a different permanent activation key. Because a Cisco ASA device can have only one permanent activation key installed at any given time, every new key must encompass the entire set of desired features. The feature set enabled by the new permanent activation key completely replaces the previously enabled permanent feature set, instead of merging with it. In rare situations in which the permanent activation key becomes lost or corrupted, the output of the **show activation-key** command displays the following value:

```
Running Permanent Activation Key: 0x00000000 0x00000000 0x00000000 0x00000000
0x00000000
```

If this happens, the system continues to operate with the default set of basic features for the platform. Reinstall the permanent activation key to restore the desired feature set. Although you can always obtain the replacement key from Cisco, it is a best practice to always maintain a backup of all activation keys used by your Cisco ASA devices.

In addition to the permanent activation key, you can install one or more time-based keys to enable certain features for a limited period of time. All premium features can be activated by either permanent or time-based keys, with the exception of Botnet Traffic Filter, which is only available via a time-based license. Even though you can apply multiple time-based activation keys on the same Cisco ASA concurrently, only one license remains active for any particular feature at any given time. Thus, several time-based keys can stay active on the ASA as long as they enable different features. Other time-based keys remain installed but inactive until needed. Only the currently active licenses for each feature continue the time countdown; you can stop the timer by manually deactivating a key or installing a different time-based license for the same feature. In Cisco ASA Software version 8.3(1) and later, time-based key expiration no longer depends on the configured system time and date; the countdown occurs automatically based on the actual uptime of the ASA.

Combining Keys

Even though only one time-based activation key can be active for any particular feature at any given time, two identical time-based keys will license a feature for the combined duration. All of the following conditions must be satisfied for this to happen:

- Both current and new time-based keys enable only one feature. Typically, this is how you receive all time-based activation keys from Cisco.
- Both keys license the feature at exactly the same level. If the feature is tiered, the licensed capacities have to match.

For example, assume that you have a Cisco ASA 5555-X with an active time-based key that enables 1000 AnyConnect Premium Peers for six weeks. If you add another time-based key for 1000 AnyConnect Premium Peers that has a duration of eight weeks, the new key will have the combined duration of 14 weeks. However, the new key will deactivate the original time-based license if it enables 2500 AnyConnect Premium Peers instead or also adds the Intercompany Media Engine feature. If you install another time-based key for the IPS Module feature on the same device, both keys will activate concurrently because they enable different features. To ease the management of time-based licenses and receive the maximum advantage of combining their duration when possible, always make sure to use separate time-based activation keys for each feature and tiered capacity.

When activated on the same device, the features and capacities of the permanent and active time-based keys also combine to form a single feature set, as such:

- The system chooses the better value between the two key types for any feature that can be either enabled or disabled. For example, the ASA enables the Intercompany Media Engine feature based on the permanent key even if all active time-based keys have this feature disabled.
- For AnyConnect Premium Sessions and AnyConnect Essentials licenses that are tiered, the system picks the highest session count between the active time-based and permanent keys.

- Total UC Proxy and Security Contexts counts combine between the permanent and active time-based keys up to the platform limit. This way, you can configure a total of 22 virtual contexts by adding a time-based license for 20 contexts to a Cisco ASA 5515-X with the permanent Base License for 2 contexts.

Example 3-1 illustrates a Cisco ASA that derives its feature set from the permanent and one time-based activation keys. Both activation keys appear at the top of the output. Features denoted as *perpetual* come from the permanent activation key; these licenses never expire. Time-based features show the remaining number of days before expiration; even if you enable one of these features via the permanent key later on, the countdown will continue until the applicable time-based key expires or becomes deactivated manually.

Time-Based Key Expiration

When a time-base key is within 30 days of expiration, ASA generates daily system log messages to alert you of that fact. The following message includes the specific time-based activation key that is about to expire:

```
%ASA-4-444005: Timebased license key 0x8c9911ff 0x715d6ce9 0x590258cb
0xc74c922b 0x17fc9a will expire in 29 days.
```

When the active time-based license expires, a Cisco ASA looks for another available time-based activation key that you previously installed. The system picks the next key according to internal software rules, so a particular order is not guaranteed. You can manually activate a specific time-based key at any given time; after you do so, the deactivated time-based key remains installed with the unused licensed time still available. When all time-based keys for a particular feature expire, the device falls back to using the value in the permanent key for this feature. Upon any expiration event, an ASA generates another system log message that lists the expired key and the succession path for the license. The following message shows that the states of all licensed features from the expired time-based key reverted to the permanent key:

```
%ASA-2-444004: Timebased activation key 0x8c9911ff 0x715d6ce9 0x590258cb
0xc74c922b 0x17fc9a has expired.  Applying permanent activation key 0x725e3a19
0xe451697e 0xcd509dd4 0xeea888f4 0x1bc79c.
```

As time-based licenses expire, certain features may deactivate completely and some licensed capacities of other features may reduce. Although these changes typically do not affect existing connections that are using a previously licensed feature, new connections will see the impact. For instance, assume that a Cisco ASA 5545-X appliance has the permanent activation key for 100 AnyConnect Premium Peers and a time-based license for 1000 AnyConnect Premium Peers. If there are 250 active clientless SSL VPN peers connected when the time-based key expires, the ASA appliance will not admit any new SSL VPN users until the session count drops below 100. However, the existing user sessions would remain operational with no impact. On the other hand, the Botnet Traffic Filter feature disables dynamic updates when the license expires; this removes the benefits of the feature right away.

Some features may show no impact from the time-based key expiration until the Cisco ASA system reloads; because the feature is no longer licensed upon the reload, the device may reject some elements of the startup configuration. When a Cisco ASA that was previously licensed for 20 security contexts reloads with the default license, only two virtual contexts will remain operational after the system loads the startup configuration file. To avoid unexpected network outages, it is very important to monitor time-based licenses for expiration and replace them in advance; always use permanent licenses for the critical features when possible.

Using Activation Keys

To apply an activation key to the Cisco ASA, you can use the **activation-key** command followed by the hexadecimal key value. Both permanent and time-based keys follow the same process, and you cannot determine the key duration until you attempt to install it. Example 3-2 shows a successful attempt to activate the permanent key. Keep in mind that an ASA supports only one of such keys at any given time; the feature set of the last installed key completely overwrites the previous one.

Example 3-2 *Successfully Activated Permanent Key*

```
ciscoasa# activation-key 813cd670 704cde05 810195c8 e7f0d8d0 4e23f1af
Validating activation key. This may take a few minutes...
Both Running and Flash permanent activation key was updated with the requested key.
```

As shown in Example 3-3, the system specifically notes a time-based key as such during the same activation process; you can see the remaining time before expiration as well.

Example 3-3 *Successfully Activated Time-Based Key*

```
ciscoasa# activation-key d069a6c1 b96ac349 4d53caa7 d9c07b47 063987b5
Validating activation key. This may take a few minutes...
The requested key is a timebased key and is activated, it has 7 days remaining.
```

When you add a new time-based activation key that enables a single feature at the same level as another currently active key, the remaining time from the current key adds to the new key, as shown in Example 3-4. Keep in mind that both the current and new time-based keys must enable only one feature with the exact same capacity, if applicable; otherwise, the new key will deactivate and replace the current one.

Example 3-4 *Time-Based Activation Key Aggregation*

```
ciscoasa# activation-key fa0f53ee a906588d 5165c36f f01c24ff 0abfba9d
Validating activation key. This may take a few minutes...
The requested key is a timebased key and is activated, it has 63 days remaining,
including 7 days from currently active activation key.
```

You can also deactivate a previously installed time-based license using the optional **deactivate** argument at the end of the **activation-key** *key* command, as shown in Example 3-5; this keyword is not available for the permanent activation key. After it is deactivated, the time-based key remains installed on the Cisco ASA. You can always reactivate this license later either manually or automatically upon the expiration of another time-based license.

Example 3-5 *Deactivating a Time-Based Key*

```
ciscoasa# activation-key d069a6c1 b96ac349 4d53caa7 d9c07b47 063987b5 deactivate
Validating activation key. This may take a few minutes...
The requested key is a timebased key and is now deactivated.
```

In rare cases, the new permanent key that disables certain features may require a reload of the system before the change occurs. Example 3-6 shows the warning that the system displays before the strong encryption feature gets disabled by the new permanent license.

Example 3-6 *Disabling a Feature with Reload Requirement*

```
ciscoasa# activation-key 6d1ff14e 5c25a1c8 556335a4 fa20ac94 4204dc81
Validating activation key. This may take a few minutes...
The following features available in running permanent activation key are NOT
available in new permanent activation key:
   Encryption-3DES-AES
WARNING: The running activation key was not updated with the requested key.
Proceed with update flash activation key? [confirm]y
The flash permanent activation key was updated with the requested key,
and will become active after the next reload.
```

Because activation keys tie to a particular device using the serial number, it is possible to attempt to activate a key from one Cisco ASA on another; the software automatically checks for such errors and rejects an incorrect key. Example 3-7 illustrates such an attempt.

Example 3-7 *Invalid Activation Key Rejected*

```
ciscoasa# activation-key 350ded58 7076f6c6 01221110 c67c806c 832ccf9f
Validating activation key. This may take a few minutes...
not supported yet.
ERROR: The requested activation key was not saved because it is not valid for this
system.
```

In older Cisco ASA Software versions, it is also possible for the system to reject an activation key when it contains unknown features. In Cisco ASA 8.2(1) and later software, all keys are backward compatible regardless of whether new features are present or not. For instance, when you downgrade from Cisco ASA 9.1(2) to 9.0(2) software with the IPS

Module license enabled, the same activation key remains valid after the downgrade even though the older software no longer supports this feature.

Combined Licenses in Failover and Clustering

Prior to Cisco ASA Software version 8.3(1), both units in a failover pair required identical licensed feature sets. Given that most designs used the Active/Standby failover configuration, this led to underutilization of licensed capacities. After the changes in Cisco ASA 8.3(1) software, only the following license requirements remain for the ASA devices that participate in failover or clustering:

- For failover, Cisco ASA 5505, ASA 5510, and ASA 5512-X appliances must have the Security Plus license installed.
- For clustering, all participating Cisco ASA 5585-X appliances with SSP-10 and SSP-20 must have either the Base license or the Security Plus license. These have to match because all cluster members must have the 10GE I/O feature in the same state.
- For clustering, each Cisco ASA 5580 and ASA 5585-X unit must have the Cluster feature enabled independently. Cisco ASA 5500-X appliances require Cisco ASA 9.1(4) software to use this feature, and it is enabled by default on all Cisco ASA 5515-X, ASA 5525-X, ASA 5545-X, and ASA 5555-X models and on the Cisco ASA 5512-X with the Security Plus license.
- For both failover and clustering, all units must have the same encryption license. The Encryption-3DES-AES license must be in the same state on both failover peers and all cluster members.

After satisfying these basic requirements, the rest of the licensed features and capacities from both failover peers and all active cluster members combine to form a single feature set that all the participating devices use concurrently.

License Aggregation Rules

The system follows these steps to create a combined feature set of a failover pair or a cluster:

1. Each failover unit or cluster member computes its local feature set by combining the permanent and active time-based activation keys using the rules discussed earlier.
2. For each feature that can be either enabled or disabled, the combined failover or cluster license inherits the best setting from all of the feature sets of the participating devices. For instance, each unit of a cluster enables the IPS Module license if at least one of the members has it enabled in the local feature set.
3. For each tiered feature, the licensed capacities of the individual units combine up to the platform limit of each member. This happens even if the particular tiered counts for the same feature do not match between all participating members. Consider a failover pair of Cisco ASA 5525-X appliances where both the primary and secondary

units have the active AnyConnect Premium Peers licenses for 500 sessions each. After aggregating these capacities, each device in this failover pair allows up to 750 sessions for this feature. Notice that the combined count of 1000 sessions from the individual licenses exceeds the Total VPN session count of 750 for this platform; this causes the downward adjustment.

After license aggregation, each failover peer or cluster member displays an additional section in the output of the **show version** and **show activation-key** commands to reflect the combined active feature set of the device. As shown in Example 3-8, this feature set supersedes the licensed feature set of the local unit as long as it continues to participate in a failover pair or a cluster.

Example 3-8 *Aggregated Cisco ASA License Information with Failover or Clustering*

```
Failover cluster licensed features for this platform:
Maximum Physical Interfaces       : Unlimited      perpetual
Maximum VLANs                     : 1024           perpetual
Inside Hosts                      : Unlimited      perpetual
Failover                          : Active/Active  perpetual
Encryption-DES                    : Enabled        perpetual
Encryption-3DES-AES               : Enabled        56 days
Security Contexts                 : 4              perpetual
GTP/GPRS                          : Disabled       perpetual
AnyConnect Premium Peers          : 4              perpetual
AnyConnect Essentials             : Disabled       perpetual
Other VPN Peers                   : 10000          perpetual
Total VPN Peers                   : 10000          perpetual
Shared License                    : Disabled       perpetual
AnyConnect for Mobile             : Disabled       perpetual
AnyConnect for Cisco VPN Phone    : Disabled       perpetual
Advanced Endpoint Assessment      : Disabled       perpetual
UC Phone Proxy Sessions           : 54             56 days
Total UC Proxy Sessions           : 54             56 days
Botnet Traffic Filter             : Disabled       perpetual
Intercompany Media Engine         : Disabled       perpetual
10GE I/O                          : Enabled        perpetual
Cluster                           : Enabled        perpetual

This platform has an ASA5585-SSP-20 VPN Premium license.
```

If a device loses the connection to its failover peer or a cluster for over 30 days, it falls back to its locally licensed feature set. You can use the **clear configure failover** or **clear configure cluster** command to manually remove the aggregated license and force the unit to revert to its locally activated features before the 30-day period expires. This capability is useful when splitting failover or cluster members to configure them as shared VPN licensing peers instead.

Aggregated Time-Based License Countdown

If the combined failover pair or cluster license relies on time-based activation keys to activate any features or aggregate licensed capacities, the countdown rules for these keys depend on the feature type:

- For any features that can be either enabled or disabled, only one participating unit continues the countdown at any given time. When this license expires, another device starts the countdown of its own time-based key for this feature. This way, the total licensed duration for this feature type combines from all applicable time-based activation keys in a failover pair or a cluster. Consider a failover pair where the primary unit has the Botnet Traffic Filter license for 52 weeks and the secondary unit has the same active license for 28 weeks. Only the primary Cisco ASA will continue the countdown of this license for the first 52 weeks of failover pair operation. After this activation key on the primary unit expires, the secondary unit will begin the countdown for another 28 weeks. As the result, you can benefit from the Botnet Traffic Filter feature in this failover pair without interruption for a combined duration of 80 weeks. If a unit loses communication with its failover peer or cluster for less than 30 days, the combined license still covers this period of independent operation for this device. If the interval of separation exceeds 30 days, the device subtracts the entire period from its local time-based license upon restoration of failover or cluster communication.
- Any time-based keys for tiered capacity features that contribute to the aggregated failover pair of cluster limits continue the countdown concurrently on their respective Cisco ASA units. Assume a cluster of four Cisco ASA 5580 appliances where each member has a 52-week license for ten virtual contexts in addition to the permanent key with two contexts. The combined license of the cluster allows configuring and using up to 48 virtual contexts for 52 weeks because all time-based tiered capacity licenses count down concurrently on all members. After 52 weeks, the combined cluster license drops down to eight security contexts based on the remaining permanent licenses of each member.

Shared Premium VPN Licensing

It may become cost prohibitive to obtain multiple separate AnyConnect Premium Peers licenses if you manage a large number of Cisco ASA appliances that terminate SSL VPN, Clientless SSL VPN, and IPsec IKEv1-based remote-access VPN sessions. Even though individual appliances may reach the maximum expected number of concurrent VPN sessions at different times, it is unlikely that all of them will always remain at the peak load. Instead of obtaining a tiered AnyConnect Premium Peers capacity license to cover the worst-case scenario for each Cisco ASA in your network, you have the option of configuring your devices to share a pool of such licenses and request premium VPN session capacities as needed.

Shared Server and Participants

To utilize a shared license pool for AnyConnect Premium sessions, you need to designate one Cisco ASA in the network as the shared licensing server. Other ASA devices that terminate AnyConnect Premium sessions become shared licensing participants. The server maintains the shared licenses and issues them to participants as necessary. You can optionally designate one participant ASA as the backup shared licensing server; this device will manage the shared pool only when the primary shared server becomes unavailable.

Shared License

Like other licensed capabilities, the Shared License feature can be either enabled or disabled. However, it could also link with the tiered capacity of Shared AnyConnect Premium Peers when enabled. When the output of the **show version** or **show activation-key** command simply shows the Shared License feature as enabled, it means that the particular Cisco ASA can act as a shared licensing participant or a backup server. The same output from a shared licensing server also displays the associated quantity of shared licenses in the pool, as shown in Example 3-9.

Example 3-9 *Shared Server License*

```
Shared License                    : Enabled        56 days
  Shared AnyConnect Premium Peers : 1000           perpetual
```

Keep in mind that the Shared AnyConnect Premium Peers license is not available separately from the Shared License feature; the particular activation key must enable this capability and specify the shared session capacity in order to enable a shared licensing server. You cannot use the regular AnyConnect Premium Peers license to provision or expand the shared session pool. Only the participant license can activate with a time-based activation key; the shared server license must use the permanent key.

Shared Licensing Operation

After you install the appropriate licenses on the server and participants, you can configure these devices to share the licensed pool of AnyConnect Premium sessions. The server may also act as a participant without a separate license; it always uses the Shared AnyConnect Premium Peers capacity when terminating SSL VPN connections itself even if it has a regular AnyConnect Premium Peers license installed. Keep in mind that any Cisco ASA device may participate in a shared licensing domain under the following conditions:

- Each device has the Shared License feature enabled. Because hardware models do not have to match within a single domain, any device except a Cisco ASA 5505 can be the server or a participant.
- You configure each participant ASA with the same shared secret value as the licensing server.

- Each participant ASA has bidirectional IP reachability with the configured shared server and backup server, if applicable. The communication channel uses SSL encryption and allows crossing intermediate routers.

Each participant ASA follows this process when handling AnyConnect Premium connections:

1. Register with the shared licensing server, report the hardware model and local license information, and continue periodic polling over the communication channel.
2. Only when the system exhausts the local licensed capacity for AnyConnect Premium sessions, request additional session licenses from the shared pool in blocks of 50. The total count of locally licensed and shared sessions cannot exceed the Total VPN Sessions capacity for the platform. The server may not always provision the requested number of licenses if the remaining shared pool capacity is low.
3. Send to the server periodic refresh messages indicating that the requested allocation is still active. If the server does not hear from the participant within three consecutive refresh intervals, the allocation may expire. However, the participant continues using the allocated shared session count for up to 24 hours. If the communication channel with the server remains severed after this grace period, the device falls back to using the local licensed capacity; only new connections are affected. Even if the communication channel re-establishes within the 24-hour period, the same shared pool capacity may no longer be available on the server.
4. When the session count drops below the level that requires additional shared licenses, the client releases the allocated pool back to the server.

When you configure one of the participants to act as a backup shared licensing server, this unit must establish a communication channel to synchronize the pool information with the primary server first. When the primary licensing server goes down, the backup fully takes over the shared pool for up to 30 days of independent operation; the primary server resumes its normal duties after it comes back up. Upon initial synchronization, the backup server is only capable of five days of independent operation when the primary server goes offline; this period extends by one day every day up to the maximum of 30 days as long as the communication channel with the primary server remains operational. The following system log message is generated by the backup licensing server when the maximum allowed interval of independent operation is about to expire:

```
%ASA-4-444110: Shared license server backup has 15 days remaining as active
license server.
```

Keep in mind that both peers in a failover pair have the exact same shared licensing role. In other words, you cannot configure the primary Cisco ASA as the shared licensing server and the secondary ASA as its backup. The secondary unit takes over as the primary licensing server after a failover event; you should configure some other ASA as the backup licensing server, if desired.

Configuring Shared Licensing

You should have the following information ready before starting the configuration process of Shared Licensing:

- Shared secret key that the given shared licensing group will use.
- Identity of the designated primary shared licensing server and its IP addresses on every interface that will accept connections from participants.
- If applicable, the IP address and the serial number of the Cisco ASA that will act as the backup shared licensing server; if this device participates in failover, you need the serial number of the secondary unit as well.

Licensing Server

Configure the primary licensing server through Cisco Adaptive Security Device Manager (ASDM) by navigating to **Configuration > Device Management > Licensing > Shared SSL VPN Licenses**. Figure 3-1 shows what the configuration panel looks like if the device has the appropriate license to act as the primary licensing server.

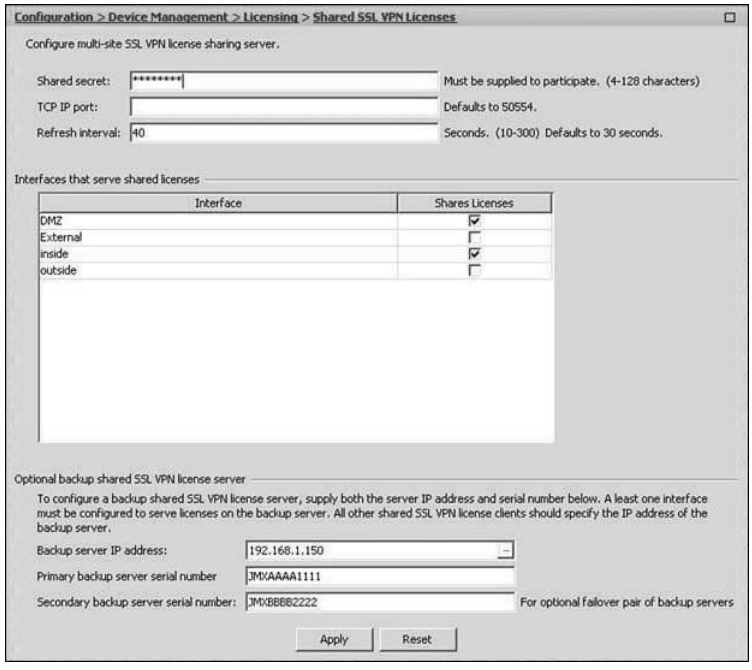

Figure 3-1 *Shared Premium VPN Licensing ASDM Configuration Pane*

Follow these steps to configure the shared licensing server on this ASDM panel:

1. Set the shared secret. Configure the same value on all of the participants within the same shared licensing domain.
2. Optionally, set a particular TCP port that the participants would use to connect to the server. It is not recommended to change the default value of 50554.
3. Optionally, change the refresh interval that the participants use to regularly confirm the active status of a shared session count allocation. The server releases the allocation back into the shared pool if it does not hear from the participant for three times the configured refresh interval.
4. Enable participant connections on the respective local interfaces of the shared server. Keep in mind that a participant can only connect to the "closest" interface of the licensing server. If the server ASA can reach a particular participant on the DMZ interface, that participant cannot connect to the server's inside interface instead.
5. Optionally, configure the IP address and the serial number of the Cisco ASA that will act as the backup shared licensing server. If this device has failover configuration, you need to specify the serial number of the failover peer as well.

Participants

After you have configured the shared licensing server, configure each participant using the following steps:

1. Specify the address of the closest interface of the shared licensing server and the shared secret value with the **license-server** command. If you changed the default TCP port on the server, you need to specify it here as well. The command has the following syntax:

```
license-server address server-IP secret shared-secret [port tcp-port]
```

2. If applicable, specify the IP address of the backup shared licensing server:

```
license-server backup backup-server-IP
```

Backup Licensing Server

To configure a participant to act as the backup licensing server, add the following command for each interface that would accept connections from other participants when the primary server is down:

```
license-server backup enable local-interface-name
```

Monitoring Shared Licensing Operation

Use the **show shared license** command to monitor the communication between the shared license server and its participants. This command also displays information about the shared pool size and utilization as well as the local platform limits. The specific output depends on whether you are looking at the server or a participant. Example 3-10 illustrates a sample output from a shared licensing server.

Example 3-10 *Shared License Server Statistics*

```
asa# show shared license

Shared license utilization:
  AnyConnect Premium:
    Total for network :     4500
    Available         :     4500
    Utilized          :        0
  This device:
    Platform limit    :      750
    Current usage     :        0
    High usage        :        0

  Client ID           Usage   Hostname
  FCH12345678         0       ASA-5555
```

Summary

Every Cisco ASA device provides a very comprehensive feature set through a combination of basic capabilities and platform capacities to service any secure network. This chapter discussed license mechanisms for advanced security features that add additional layers of protection or accommodate more complex network designs. It also explained how to scale the Cisco ASA capabilities as your network grows by leveraging tiered capacity licenses for certain features. This chapter covered permanent and time-based activation keys that allow you to create and manage the appropriate feature set for any given Cisco ASA device. It provided an overview of how failover and clustering features enable aggregation of the licensed capacities to increase the efficiency of your investment. The final sections showed how you can group multiple ASA devices to service premium VPN sessions from a shared license pool.

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