Newer Cisco SBA Guides Available

This guide is part of an older series of Cisco Smart Business Architecture designs. To access the latest Cisco SBA Guides, go to http://www.cisco.com/go/sba

Cisco strives to update and enhance SBA guides on a regular basis. As we develop a new series of SBA guides, we test them together, as a complete system. To ensure the mutual compatibility of designs in Cisco SBA guides, you should use guides that belong to the same series.
Preface

Who Should Read This Guide

This Cisco® Smart Business Architecture (SBA) guide is for people who fill a variety of roles:

- Systems engineers who need standard procedures for implementing solutions
- Project managers who create statements of work for Cisco SBA implementations
- Sales partners who sell new technology or who create implementation documentation
- Trainers who need material for classroom instruction or on-the-job training

In general, you can also use Cisco SBA guides to improve consistency among engineers and deployments, as well as to improve scoping and costing of deployment jobs.

Release Series

Cisco strives to update and enhance SBA guides on a regular basis. As we develop a new series of SBA guides, we test them together, as a complete system. To ensure the mutual compatibility of designs in Cisco SBA guides, you should use guides that belong to the same series.

All Cisco SBA guides include the series name on the cover and at the bottom left of each page. We name the series for the month and year that we release them, as follows:

**month year** Series

For example, the series of guides that we released in August 2011 are the “August 2011 Series”.

You can find the most recent series of SBA guides at the following sites:

- Partner access: [http://www.cisco.com/go/sbachannel](http://www.cisco.com/go/sbachannel)

How to Read Commands

Many Cisco SBA guides provide specific details about how to configure Cisco network devices that run Cisco IOS, Cisco NX-OS, or other operating systems that you configure at a command-line interface (CLI). This section describes the conventions used to specify commands that you must enter.

Commands to enter at a CLI appear as follows:

```
configure terminal
```

Commands that specify a value for a variable appear as follows:

```
ntp server 10.10.48.17
```

Commands with variables that you must define appear as follows:

```
class-map [highest class name]
```

Commands shown in an interactive example, such as a script or when the command prompt is included, appear as follows:

```
Router# enable
```

Long commands that line wrap are underlined. Enter them as one command:

```
wrr-queue random-detect max-threshold 1 100 100 100 100 100 100 100 100
```

Noteworthy parts of system output or device configuration files appear highlighted, as follows:

```
interface Vlan64
   ip address 10.5.204.5 255.255.255.0
```

Comments and Questions

If you would like to comment on a guide or ask questions, please use the forum at the bottom of one of the following sites:

- Partner access: [http://www.cisco.com/go/sbachannel](http://www.cisco.com/go/sbachannel)

An RSS feed is available if you would like to be notified when new comments are posted.
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Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

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About SBA
Cisco SBA helps you design and quickly deploy a full-service business network. A Cisco SBA deployment is prescriptive, out-of-the-box, scalable, and flexible.

Cisco SBA incorporates LAN, WAN, wireless, security, data center, application optimization, and unified communication technologies—tested together as a complete system. This component-level approach simplifies system integration of multiple technologies, allowing you to select solutions that solve your organization’s problems—without worrying about the technical complexity.

For more information, see the How to Get Started with Cisco SBA document:

About This Guide
This additional deployment guide includes the following sections:
• Business Overview—The challenge that your organization faces. Business decision makers can use this section to understand the relevance of the solution to their organizations’ operations.
• Technology Overview—How Cisco solves the challenge. Technical decision makers can use this section to understand how the solution works.
• Deployment Details—Step-by-step instructions for implementing the solution. Systems engineers can use this section to get the solution up and running quickly and reliably.

This guide presumes that you have read the prerequisites guides, as shown on the Route to Success below.

Route to Success
To ensure your success when implementing the designs in this guide, you should read any guides that this guide depends upon—shown to the left of this guide on the route above. Any guides that depend upon this guide are shown to the right of this guide.

For customer access to all SBA guides: http://www.cisco.com/go/sba
For partner access: http://www.cisco.com/go/sbachannel
Introduction

Business Overview
IPv4 addresses are becoming harder to get and eventually will no longer be available. The last IPv4 allocations have been handed out by the Internet Assigned Numbers Authority (IANA), and the regional Internet registries (RIRs) will run out of IPv4 addresses at some point. Technologies like Network Address Translation (NAT) and the use of RFC 1918 addressing will allow most organizations to continue operating on IPv4 for the foreseeable future, but the transition to IPv6 is coming, and new devices and organizations will begin running on IPv6 soon.

Most customer interaction currently happens over IPv4, but the transition to IPv6 is already occurring in some regions of the world and will quickly spread worldwide. Many governments are mandating the use of IPv6 in government, education, and public Internet deployments. If you plan and implement IPv6 in parallel to IPv4 today, you can help ensure that you can connect to new customers and markets tomorrow.

Technology Overview
Cisco Smart Business Architecture (SBA) easily accommodates IPv6 Internet Edge servers. This guide describes how your organization can stay ahead of the technology curve by providing Internet server access via native IPv6 without interruption to IPv4 clients. A network supporting dual stacks—IPV4 and IPv6 simultaneously—allows for IPv4 and IPv6 to coexist.

This guide shows how to use existing hardware in the Internet Edge to support native IPv6 access to Internet-facing services, a web server in this example.

IPv6 can be added to the Cisco SBA Internet Edge through additional configuration of existing software that is specified for the existing IPv4 Internet Edge. After you perform the procedures in this guide, both IPv4 and IPv6 networks will coexist on the same equipment but will be logically separate.

IPv4 will be in use for years to come; during the migration to IPv6, it is critical to support both address spaces. This configuration builds an IPv6 infrastructure upon the existing IPv4 network. This configuration is intended to be an add-on to the existing foundation deployment; it will not function properly on its own.

The solution described in this guide accommodates IPv6 web traffic, specifically HTTP/HTTPS web traffic to and from the Internet Edge. This solution assumes:

- The ISP has provisioned an IPv6 Ethernet handoff.
- The Internet Edge routers in this diagram are in the provider network and are not included as part of the configuration.
- The Internet Edge routers will have a route directing IPv6 traffic to the networks that are hosted on the organization’s Cisco Adaptive Security Appliances (ASA) firewall.
- IPv6 connectivity from the ISP border router will terminate on a pair of resilient Cisco ASA firewalls.

The Cisco ASA firewalls provide the following:

- Termination of the ISP IPv6 connection
- Static routing to the ISP network
- Security with IPv6 access control lists
- Intrusion prevention for servers in the IPv6 DMZ

As you plan for your IPv6 deployment, you need to take your organization’s security policy into account. IPv6 is a different protocol, but applications operate the same as they do over IPv4. The Cisco ASA firewall for IPv4 provides application inspection and IPS for applications running over IPv4. The IPv4 security policy deployed currently in the Internet Edge deployment carries over to IPv6 networking. This design configures ACLs that permit HTTP, HTTPS, and certain types of Internet Control Message Protocol (ICMP) traffic.

Domain Name System
Domain Name System (DNS) for IPv6 is handled by the ISP in the example in this guide. IPv6 introduces the AAAA record, which maps an IPv6 address to a host. This is similar to an A record in IPv4 DNS, which maps an IPv4 address to a host. In the configuration described in this guide, you do not have to deploy IPv6 DNS on the server. However, the ISP does need to deploy IPv6 DNS to propagate the web server’s address to IPv6 clients on the Internet.
Deployment Details

The Cisco ASA firewalls configured in the Internet Edge are configured and managed via IPv4, and this will not change with this configuration. The Internet Edge guidance in the Foundation Deployment Guide provides for IPv4 connectivity, high availability, and management. Existing IPv4 connectivity is not affected by the configuration described in this guide.

Recommended Deployment Setup for IPv6 Internet Edge

This guide uses IPv6 addresses from the range 2001:0DB8::/32, which is a non-Internet-routable range defined in RFC 3849 for use in documentation. Internet-routable IPv6 address space can be obtained from an ISP or provider-independent space allocated by a local RIR.

---

Table 1 - IPv6 addresses for this configuration

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>IPv6 address</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISP Internet Edge Router</td>
<td>2001:DB8:A::7206/64</td>
</tr>
<tr>
<td>ASA Outside Interface Primary</td>
<td>2001:DB8:A::1/64</td>
</tr>
<tr>
<td>ASA Outside Interface Secondary</td>
<td>2001:DB8:A::2/64</td>
</tr>
<tr>
<td>ASA DMZ Interface Primary</td>
<td>2001:DB8:A:1::1/64</td>
</tr>
<tr>
<td>ASA DMZ Interface Secondary</td>
<td>2001:DB8:A:1::2/64</td>
</tr>
<tr>
<td>Web server in DMZ</td>
<td>2001:DB8:A:1::5/64</td>
</tr>
</tbody>
</table>
Process

Configuring IPv6 on the Cisco ASA Firewall
1. Configure IPv6 on Cisco ASA interfaces
2. Configure high availability for IPv6
3. Configure static routing for IPv6

Procedure 1  Configure IPv6 on Cisco ASA interfaces

Step 1: Connect to Cisco Adaptive Security Device Manager (ASDM) by navigating to https://<ASA-IP-Address>/admin, and then logging in with your username and password.

Step 2: Navigate to Configuration > Device Setup > Interfaces.

Step 3: Select the outside interface, and then click Edit. The Edit Interface dialog box appears.
Step 4: In the Edit Interfaces dialog box, click the IPv6 tab, select Enable IPv6, and then, under Interface IPv6 Addresses, click Add.

Step 5: Enter the outside IPv6 address, 2001:db8:a::1/64, and then click OK.

Step 6: Repeat Step 3 through Step 5, selecting the DMZ interface and using the IPv6 address 2001:db8:a:1::1.
Step 7: At the bottom of the window, click **Apply**. This saves the configuration.

Procedure 2  Configure high availability for IPv6

High availability (HA) allows the firewall to continue operating in the event of a failure. To ensure that failover works properly, for each interface configured for IPv6 you must configure an HA IPv6 address for the secondary Cisco ASA interface.

Step 1: Navigate to **Configuration > Device Management > High Availability > Failover > Interfaces**. On the Interfaces tab, the interfaces configured for IPv4 and IPv6 are displayed.

Step 2: Select the IPv6 outside interface, click the empty Standby IP Address field, type the failover IPv6 address **2001:db8:a::2**, and then press **Enter**.

Step 3: Select the IPv6 DMZ interface, click the empty Standby IP Address field, type the failover IPv6 address **2001:db8:a:1::2**, and then press **Enter**.

Step 4: At the bottom of the window, click **Apply**. This saves the configuration.

Procedure 3  Configure static routing for IPv6

Next, configure static routing for IPv6 Internet access on the Cisco ASA interface. This setup uses a static default route to send IPv6 traffic to the ISP.

Step 1: Navigate to **Configuration > Device Setup > Routing > Static Routes**, select **IPv6 only**, and then click **Add**. The Add Static Route dialog box appears.
Step 2: In the Add Static Route dialog box enter the values below, and then click OK.

- Interface—outside
- Network—any
- Gateway IP—2001:db8:a::7206

The static route table reflects the new values.

Step 3: At the bottom of the window, click Apply. This saves the configuration.

Process

Configuring Cisco ASA Interfaces to Permit Access to IPv6 Web Servers
1. Add a rule to permit HTTP/HTTPS traffic
2. Add a rule to permit IPv6 ICMP traffic

Procedure 1 Add a rule to permit HTTP/HTTPS traffic

When you perform this procedure to create the rule to permit HTTP and HTTPS traffic to the IPv6-enabled web server, you create an object group for the IPv6 network in the DMZ. Network objects make it easier to read the firewall configuration and can help reduce errors; it is recommended that you build network objects as you add firewall rules.
Step 1: Navigate to Configuration > Firewall > Access Rules, select IPv6 Only, select Global IPv6, and then click Add. Make sure that Interface is set to any.

Step 2: In the IPv6 Access Rule dialog box, in the Destination text box, click the ellipsis button (…).

Step 3: In the Browse Destination dialog box that appears, click Add, and then select Network Object.

Step 4: In the Edit Network Object dialog box, enter the values listed below and then click OK.
- Name—dmz-web-net-v6
- Type—Network
- IP Address—2001:db8:a:1::
- Prefix Length—64
**Step 5:** Double-click the network object that was just created, and then click OK.

**Step 6:** In the IPv6 Access Rule dialog box, in the **Service** text box, click the ellipsis button (…).

**Step 7:** In the Browse Service dialog box, scroll down and double-click **http** and **https**, and then click OK.

**Step 8:** Verify that the Add IPv6 Access Rule dialog box resembles the following illustration, and then click OK.
The rule that was just created will appear in the Global IPv6 rule table.

Step 9: At the bottom of the window, click **Apply**. This saves the configuration.

**Procedure 2** Add a rule to permit IPv6 ICMP traffic

For troubleshooting and general operations, you should permit some types of ICMP traffic. The *Cisco SBA for Midsize Organizations—Borderless Networks Foundation Deployment Guide* permits ICMP traffic for IPv4. The following procedure synchronizes the IPv6 and IPv4 ICMP policies.

**Step 1:** Navigate to **Configuration > Firewall > Access Rules**, select **IPv6 Only**, select **Global IPv6**, and then click **Add**.

**Step 2:** In the **Service** text box, click the ellipsis button (…).

**Step 3:** In the **Browse Service** dialog box, double-click **echo**, **echo-reply**, **time-exceeded**, and **unreachable**, and then click **OK**.

**Step 4:** In the **Add IPv6 Access Rule** dialog box, click **OK**.

**Step 5:** The rule that was just created will appear in the Global IPv6 rule table.

**Step 6:** At the bottom of the window, click **Apply**. This saves the configuration.
In this procedure, you configure the Cisco ASA network interface on a Windows 2008 server to support IPv6.

Step 1: From the Windows Server 2008 GUI, click Start, right-click Network, and then click Properties. The Network and Sharing Center opens.

Step 2: To open Network Connections, click Change Adapter Settings.

Step 3: Right-click the Ethernet interface, and then click Properties.

Step 4: If Internet Protocol Version 6 (TCP/IPv6) is not checked, select it, and then click OK to close the Properties page.

Step 5: Reopen the Properties page, and then continue with Step 6 of this procedure. If you do not close and reopen the page, the first time you enable IPv6, you will get an error and be unable to provision an IPv6 address.

Step 6: Select Internet Protocol Version 6 (TCP/IPv6), and then click Properties.
Step 7: Select **Use the following IPv6 address**. Enter the following values in the Internet Protocol Version 6 (TCP/IP) Properties dialog box.

- IPv6 Address—**2001:db8:a:1::5**
- Subnet Prefix Length—**64**
- Default Gateway—**2001:db8:a:1::1**

Step 8: Click **OK** to exit, and then on the Ethernet interface, click **OK** again. The configuration is complete.

Step 9: Verify that the IPv6 configuration is correct by typing **ipconfig** in a command line window.
The following products and software versions have been validated for Cisco SBA.

<table>
<thead>
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<th>Functional Area</th>
<th>Product</th>
<th>Part Numbers</th>
<th>Software Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet Edge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firewall</td>
<td>ASA 5510 or ASA 5520 or ASA 5540</td>
<td>ASA5510-AIP10-SP-K9</td>
<td>8.4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASA5520-AIP20-K9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASA5540-AIP40-K9</td>
<td></td>
</tr>
<tr>
<td>Firewall Management</td>
<td>Adaptive Security Device Manager (ASDM)</td>
<td>ASA5520-AIP20-K9</td>
<td>6.4(5)</td>
</tr>
<tr>
<td>IPS</td>
<td>SSM-AIP-10 or SSM-AIP-20 or SSM-AIP-40</td>
<td>*part of the firewall bundle</td>
<td>7.0(5a)E4</td>
</tr>
</tbody>
</table>
Appendix B: CLI Configuration

ASA

interface GigabitEthernet0/1.1164
  ipv6 address 2001:db8:a:1::1/64 standby 2001:db8:a:1::2
  ipv6 enable
!
interface GigabitEthernet0/3
  ipv6 address 2001:db8:a:1::1/64 standby 2001:db8:a:1::2
  ipv6 enable
!
oobject network dmz-web-net-v6
  subnet 2001:db8:a:1::/64
!
oobject-group service DM_INLINE_TCP_1 tcp
  port-object eq www
  port-object eq https

object-group service DM_INLINE_SERVICE_1
  service-object icmp6 echo
  service-object icmp6 echo-reply
  service-object icmp6 time-exceeded
  service-object icmp6 unreachable
!
ipv6 route outside ::/0 2001:db8:a::7206
ipv6 access-list global_access_ipv6 permit tcp any object dmz-web-net-v6 object-group DM_INLINE_TCP_1
ipv6 access-list global_access_ipv6 permit object-group DM_INLINE_SERVICE_1 any any
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