APPENDIX B

CCNA 200-301, Volume 1 Exam Updates

Over time, reader feedback enables Pearson to gauge which topics give our readers the most problems when taking the exams. To assist readers with those topics, the authors create new materials clarifying and expanding on those troublesome exam topics. As mentioned in the Introduction, the additional content about the exam is contained in a PDF on this book's companion website, at http://www.ciscopress.com/title/9780135792735.

This appendix provides you with updated information if Cisco makes minor modifications to the exam topics during the life of the 200-301 exam. In particular, this appendix does the following:

- Mentions technical items that might not have been mentioned elsewhere in the book
- Covers new topics if Cisco adds new content to the exam over time
- Provides a way to get up-to-the-minute current information about content for the exam

Note that this appendix shows updated information related to the subset of CCNA 200-301 exam topics covered in this book. Refer also to the *CCNA 200-301 Official Cert Guide, Volume 2*, for more details about the rest of the exam topics and for an Appendix B similar to that of this book.

Always Get the Latest at the Book's Product Page

Many of you are reading the version of this appendix that was available when your book was printed or when you downloaded the e-book. However, given that the main purpose of this appendix is to be a living, changing document, it is important that you look for the latest version online at the book's companion website. To do so, follow these steps:

Step 1. Browse to www.ciscopress.com/title/9780135792735.

Step 2. Click the **Updates** tab.

Step 3. If there is a new Appendix B document on the page, download the latest Appendix B document.

NOTE The downloaded document has a version number. Comparing the version of the print Appendix B (**Version 1.0**) with the latest downloadable version of this appendix, you should do the following:

- **Same version:** Ignore the PDF that you downloaded from the companion website.
- **Website has a later version:** Ignore this Appendix B in your book and read only the latest version that you downloaded from the companion website.

Technical Content

This appendix may be updated over time. To that end, we assign version numbers to it. This document is at Version 1.1. Reviewing the version history:

Version 1.0: Version 1.0 of this appendix was the original version as of the publication of this book. It held no technical content.

Version 1.1: This document. Published in the second quarter of calendar year 2023, this version adds technology content plus information about exam topic changes, per the following list:

- Updates to the CCNA 200-301 Version 1.0 Exam Topics
- Routing Protocol Miscellany
- Wireless LAN Settings Addendum

The rest of this Version 1.1 adds one section for each topic in the above list.

NOTE Read the following section first, after you learn of this updated appendix, no matter where you are in your progression through reading the books.

Updates to the CCNA 200-301 Version 1.0 Exam Topics

Before you panic, Cisco did not add a lot of new technologies to the CCNA blueprint when it changed the exam blueprint in 2022. It did, however, reword some exam topics in 2022, so it is useful to look at those changes, reflect, and potentially study a few more topics. This section discusses the details.

NOTE This section is identical in the Version 1.1 Exam Updates appendix of both the Volume 1 and Volume 2 books.

Exam Topic Rewording Gives Us Insights

Cisco tells us upfront that it might change the exam topics. If you go to www.cisco.com/go/ccna, click to find the exam topic page, and download the PDF version of the exam topics, you'll find a couple of paragraphs above the list of exam topics. Many people ignore those paragraphs. Interestingly, you find this statement in them:

> "To **better reflect the contents of the exam** and for **clarity purposes**, the guidelines below may change at any time without notice." (Emphasis is mine.)

So, Cisco could leave the exam topics unchanged. Instead, it made slight changes to the wording. Why? There are two reasons, both of which give us a better understanding of the meaning of the exam topics. Personally, I always prefer to know more about what might be on an exam, and Cisco has done that with these exam topic changes.

From a practice point of view, with the changes the question becomes: What else do you need to study? That becomes a question of what, if anything, the exam topic changes add to CCNA. Then, if added, do the books already cover them? As it turns out, there are a few small topics that I think the book needs in reaction to the exam topic changes, and you will find them in the Exam Updates appendix online for the Volume 1 and Volume 2 books, respectively. This section walks through the details of what I've added.

The Exam Topic Changes

First, Cisco numbers exam topic documents, called exam blueprints, with a two-number convention of *version.release*. This book was originally written for the CCNA 200-301 exam, specifically blueprint version 1.0. That is, we wrote this book, published in late 2019, just before the CCNA 200-301 exam released in February, 2020.

Keep in mind that Cisco uses a style for exam topics with brief general wording. As a result, course authors, video creators, book authors, and even the folks creating the exam need to further interpret the exam topics. In my estimation—which might differ from yours or anyone else's—less than half the exam topic wording changes change the literal meaning of the exam topic. For those that have a change in meaning, some shrink the scope of the exam topic. Some expand the topic, but the books already cover the topic well enough. But a few impact what you need to study when using the two-volume *CCNA 200-301 Official Cert Guides*.

Table B-1 lists the exam topic wording changes Cisco made to the CCNA 200-301 Exam Blueprint in 2022. Note that the rows with gray highlights receive more attention in the following section.

Table B-1 Exam Topic Wording Changes, 2022, CCNA 200-301 V1.0

Number	New Wording	Old Wording
1.1.h	PoE	No wording change. The change renumbers from 1.3.c to 1.1.h.
1.2.a	Two-tier	2 tier
1.2.b	Three-tier	3 tier
1.9.a	Unicast (global, unique local, and link local)	Consolidates three exam topics: 1.9.a Global unicast 1.9.b Unique local 1.9.c Link local (Also renumbers 1.9.d, e, f to 1.9.b, c, d)

Number	New Wording	Old Wording
1.12	Explain virtualization fundamentals **(server virtualization, containers, and VRFs)**	Explain virtualization fundamentals **(virtual machines)**
2.1.c	**InterVLAN** connectivity	Connectivity
2.5	Interpret basic operations of Rapid PVST+ Spanning Tree Protocol	Describe the need for and basic operations of Rapid PVST+ Spanning Tree Protocol and identify basic operations
2.6	**Describe** Cisco Wireless Architectures and AP modes	**Compare** Cisco Wireless Architectures and AP modes
2.9	**Interpret** the wireless LAN GUI configuration for client connectivity, such as WLAN creation, security settings, QoS profiles, and advanced settings	**Configure** the components of a wireless LAN access for client connectivity using GUI only such as WLAN creation, security settings, QoS profiles, and advanced WLAN settings
3.2.a	Longest prefix match	Longest match
3.5	Describe the **purpose, functions, and concepts** of first hop redundancy protocols	Describe the **purpose** of first hop redundancy protocol
5.3	**Configure and verify** device access control using local passwords	**Configure** device access control using local passwords
5.5	Describe **IPsec** remote access and site-to-site VPNs	Describe remote access and site-to-site VPNs
5.8	**Compare** authentication, authorization, and accounting concepts	**Differentiate** authentication, authorization, and accounting concepts
5.10	**Configure and verify** WLAN within the GUI using WPA2 PSK	**Configure** WLAN using WPA2 PSK using the GUI
6.3	Describe controller-based, software defined architecture (overlay, underlay, and fabric)	Describe controller-based and software defined architectures (overlay, underlay, and fabric)
6.3.b	Northbound and Southbound APIs	North-bound and south-bound APIs
6.7	**Recognize components of** JSON-encoded data	**Interpret** JSON encoded data

The *CCNA 200-301 Official Cert Guides* (both Volume 1 and Volume 2) have extensive references to the original exam topics. Be aware: We will not be changing the original exam topic wording throughout the books; instead, now that you know about the small set of wording changes, you can refer to Table B-1 as needed to review the wording.

Note that the Cisco website does not list the old and new wording. Instead, when they changed the wording, it changed, with no announcement—and no one really noticed. Most of the changes simply clarify the meaning of the old wording; however, a few of the changes make me think you need to study one or two additional small topics. So, let me walk you through the changes.

Analysis of Wording Changes

I will review with you the plain meaning of the words in the exam topic, but let me tell you what I mean by that. Almost anyone who works with an exam—to write questions or create learning content—has to take the brief wording of an exam topic and create a much more detailed mental model of what is and is not included. For example, in my books, there might be a chapter that exists for a single exam topic that has a dozen words in it. Obviously, I had to expand on the meaning of that one tiny exam topic to choose what to include (or not include) in that chapter. So the comments here are about changes to the plain meaning of the words rather than my interpretation of them, or Cisco's, or anyone else's.

Now look back at Table B-1, noting the rows that do not have a gray highlight. For those, I think the plain meaning remains unchanged, or maybe it changes slightly to reduce the scope of the exam topic—meaning you have nothing more to do.

For instance, 1.2.a, 1.2.b, and 1.9.a are all rewording or changing conventions. Or, for 2.6 and 2.9, the verbs change the plain meaning ever so slightly—but to reduce what you might need to know.

However, in the rows with gray highlights, I think the plain meaning changes, and for some of those, when using these books, I think you have more to study.

ET 1.12: Explain virtualization fundamentals (server virtualization, containers, and VRFs)

This exam topic replaces "virtual machines" with "server virtualization, containers, and VRFs." That changes the plain meaning of the exam topic. But more importantly, these books did not originally discuss containers and VRFs.

Your action: Make sure you read the new content about Containers and VRFs in the Version 1.1 Appendix B, "CCNA 200-301 Volume 2 Exam Updates," in Volume 2.

ET 2.1.c: InterVLAN Connectivity

This exam topic replaces "Connectivity" with "InterVLAN connectivity." I am thrilled about this change because it takes a formerly ambiguous exam topic and makes it clear to someone who's creating learning content.

If you're just studying CCNA, "InterVLAN Connectivity" might not be clear until you learn the topic. To add some meaning:

1. Layer 2 switches create VLANs.
2. Layer 2 switching logic does not forward Layer 2 Ethernet frames between VLANs.
3. IP routing creates connectivity between VLANs by using logic at the next higher layer (the network layer) to route packets.
4. The devices in one VLAN reside in one IP subnet; the devices in another VLAN reside in another subnet, so you use IP routing to route the IP packets between the subnets.

In short, "InterVLAN connectivity" refers to supporting communications between devices in different VLANs by routing between the subnets that exist on those VLANs.

Your action: Nothing more. Volume 1 Chapter 16, "Configuring IPv4 Addresses and Static Routes," (the whole chapter) explains interVLAN connectivity in depth. If you are tracking your progress with exam topics, you should associate exam topic 2.1.c with Chapter 16 as well.

ET 3.5 Describe the purpose, functions, and concepts of first hop redundancy protocols

This exam topic replaces "purpose" with "purpose, functions, and concepts" in a clear expansion of the meaning. To prepare you for that expansion, read the new section about First Hop Redundancy Protocols (FHRPs) in the Version 1.1 Volume 2 "Exam Updates" appendix.

As for the change itself, all FHRPs have the same purpose, so the existing *CCNA 200-301 Official Cert Guide, Volume 2*, Chapter 12 devotes one major section, about seven pages, to FHRPs. That section focuses on one FHRP—HSRP—in part because you can understand the purpose of all by understanding one of the three FHRPs.

Your action: Read the FHRP coverage in the new Volume 2 Exam Updates appendix. The wording change to add "functions and concepts" begs for some additional detail about all three FHRPs beyond Volume 2's Chapter 12.

ET 5.5 Describe IPsec remote access and site-to-site VPNs

This exam topic keeps the same wording as before, except that it injects the word *IPsec*. VPNs include several protocols, with IPsec being one. Focusing on the plain meaning, the new wording limits the scope versus the old wording, keeping the discussion to only IPsec-based VPNs.

However, from a practical perspective, the *CCNA 200-301 Official Cert Guide, Volume 2*, Chapter 14, "WAN Architecture," happens to show an IPsec site-to-site VPN but not an IPsec remote access VPN. (It shows a TLS-based remote access VPN instead.)

Your action: To round out the coverage, read the new Version 1.1 of Volume 2's Exam Updates appendix about IPsec remote access VPNs.

ET 5.10 Configure and verify WLAN within the GUI using WPA2 PSK

This exam topic keeps the same wording other than changing "Configure" to "Configure and verify." I think that expands the plain meaning; however, from a practical perspective, I think it matters very little. It is almost impossible to separate the configuration and verification tasks when writing books or creating other learning content. It is also difficult to separate them when learning. So in the rare cases in which a Cisco exam topic lists only *configure*, I tend to create materials that also help you learn to verify the topic.

However, I already wanted to clarify a few points about wireless LANs in the updated Exam Updates elements. So, we added some new content, emphasizing what to look for when verifying wireless LAN configuration using the WLC.

Your action: In the new Version 1.1 of Volume 1's Exam Updates appendix, read the section, "Wireless LAN Configuration Verification and Analysis."

(As an aside, note that exam topic 5.3 also has the same change—from "configure" to "configure and verify"—so it probably has a literal change to the plain meaning as well. But the existing content already covered the verification angle well, so I didn't list it here as an exam topic that deserved more analysis.)

NOTE The following section can be used at any time; however, it is best used after reading or reviewing the chapters through Part VI, "OSPF," in the book.

Routing Protocol Miscellany

This section details a few short topics that were not emphasized or included in Parts V and VI of *CCNA 200-301 Official Cert Guide, Volume 1*.

Routing Protocol Legend in show ip route

To save space in the book, the various examples of the **show ip route** command omit the legend that begins the command's output. To bring attention to those codes, refer to the legend from the **show ip route** command in Example B-1. Make an effort to commit the highlighted codes to memory.

Example B-1 show ip route—*Most Common Legend Codes*

```
R1# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected
! Lines omitted for brevity
```

EIGRP Metric Calculations

Chapter 19, "Understanding OSPF Concepts," already explains that EIGRP uses the slowest bandwidth and the cumulative delay in a route to calculate the metric for that route. This next topic shows an example to clarify what that means and to define some related terms.

First, every router interface has a bandwidth setting. The bandwidth represents the speed of the link, so the router provides a default bandwidth setting as its best guess as to the speed. Note that the bandwidth does not in any way control the speed—it gives various IOS features a per-interface setting that represents the physical transmission speed.

For instance, on a 10/100/1000 Ethernet interface, a router sets bandwidth to a number based on current transmission speed, using a unit of kilobits/second (kbps.) When using a 1 Gbps speed, the router defaults the interface bandwidth to 1,000,000, meaning 1,000,000 kbps. You can also configure an interface's bandwidth using the **bandwidth** *speed-in-kbps* interface subcommand.

Similarly, every router interface has a delay setting. It represents the delay a packet experiences when exiting the interface. Again, the router attempts to provide a useful default, derived from the interface bandwidth, with faster bandwidths, meaning lower default interface delay settings.

The **delay** *time-in-centiseconds* interface subcommand enables you to set the delay as well. In a strange twist, the **show** commands list delay in microseconds; however, both the **delay** configuration command and the EIGRP metric calculation use a unit of tens-of-microseconds, or centiseconds.

Review Figure B-1, first focusing on the bandwidth and delay notations to the right of each router (ignoring the bubbles above the routers.) Those list the bandwidth, in kbps, and delay, in centiseconds, IOS uses as defaults when running at 10 Mbps, 100 Mbps, and 1000 Mbps (1 Gbps), as noted at the bottom of the figure. The notes to the right of the figure use units that match the EIGRP metric calculation: bandwidth in kbps and delay in centiseconds.

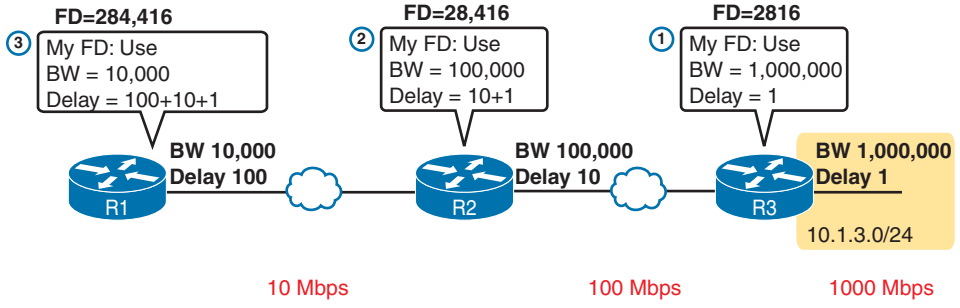

Figure B-1 *Perspectives on Bandwidth and Delay in EIGRP Metric Calculation*

Now consider the thought bubbles above the routers, which show the logic use by EIGRP on each router. The EIGRP metric calculation uses cumulative delay and least-bandwidth as input. EIGRP calls the calculated metric the feasible distance, or FD. In the figure, the bubbles above each router summarize the input to its FD calculation for the route to subnet 10.1.3.0/24 on the right. Specifically:

R3: The slowest link (the only link) uses 1,000,000 kbps and delay 1.

R2: The slowest of the links uses 100,000 kbps (the link between R2 and R3). The sum of the delay on both outgoing links is 11.

R1: The slowest link is 10,000 kbps (the link between R1 and R2.) The three outgoing interface's delay settings add up to 111.

The metric formula is $((10^7 / BW) + Delay) * 256$, although I would not expect you to need to memorize it. For instance, in the figure, if you take Router R1's values of bandwidth 10,000 (10^4), then $10^7 / 10^4$ reduces to 1000. Delay, from the thought bubble, is 111. Adding the two, you get 1111, and multiplying by 256, you get the number just above R1's thought bubble, or 284,416.

EIGRP Convergence Terms

This final part of the EIGRP discussion defines a few EIGRP terms. EIGRP calls the best route for a subnet on a router the *successor* route. For example, in Figure B-2, Router A

finds three routes to reach subnet 1. It calculates a metric for the routes through neighboring Routers B, C, and D. Router A chooses the least metric route through Router D as the successor route. EIGRP refers to the metric for that best route as the *feasible distance*, or FD. Router A places the successor route, and only that route, in its routing table.

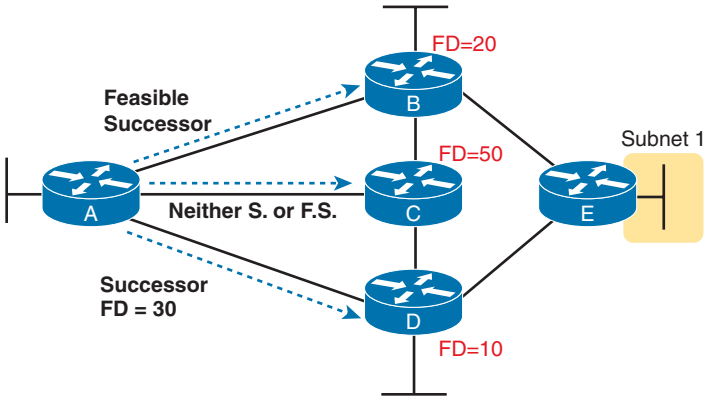

Figure B-2 *Successor and Feasible Successor Routes*

EIGRP does not place alternate routes in the routing table—but it will use those if the successor route fails. In anticipation of that, EIGRP categorizes alternate routes as either feasible successor routes or others (with no special name). EIGRP can replace a failed successor route with a feasible successor route immediately, without risking creating a routing loop—but not so with an alternate route that is not a feasible successor.

Now, knowing the categories of alternate routes, the question becomes: How does EIGRP determine whether an alternate route is a feasible successor route? Generally:

> On one router, with multiple known routes for the same subnet, knowing the successor route, if any alternate route's next-hop router has a lower FD than the local router's FD, the route is a feasible successor route.

The preceding statement begs for an example. Using Figure B-2 again, consider whether Router A's alternate routes with next-hop Routers B and C are feasible successor routes. First, Router A's successor route has an FD of 30. The figure shows the FD of next-hop routers B and C. Applying the logic:

- Router B's FD of 20 is less that Router A's FD of 30, so Router A's alternate route that uses Router B as the next hop router is a feasible successor.
- Router C's FD of 50 is more than Router A's FD of 30, so Router A's alternate route that uses Router C as the next hop router is NOT a feasible successor.

NOTE The following content adds to the wireless LAN configuration details in Chapter 29, "Building a Wireless LAN." To best use this content, finish reading Chapter 29, and then read the following content about wireless LAN verification.

Wireless LAN Settings Addendum (Chapter 29)

In 2022, Cisco slightly expanded the one exam topic that references WLAN configuration, including the verb *verify*. As a small help for that expanded exam topic, this section acts as a verification and review exercise. The exercise should help build your skills in how you think about the major configuration steps, WLC pages, and user interface input values to configure and verify wireless LANs when using a Cisco WLC.

This section begins by verifying and discussing the earlier configuration pages to create a dynamic interface and a WLAN and associate the two. The latter part of this section does the same with Layer 2 WLAN security and the WPA2 pre-shared authentication key.

Wireless LAN Configuration Verification and Analysis

Think back to Chapter 29, specifically the sections "Step 2. Create a Dynamic Interface" and "Step 3. Create a New WLAN." Those sections show the creation of a dynamic interface (Figures 29-10 through 29-12), along with the creation of a WLAN that uses that interface (Figures 29-13 through 29-15.) For perspective, Figure B-3 shows a conceptual view of some of the key configuration settings made in those figures.

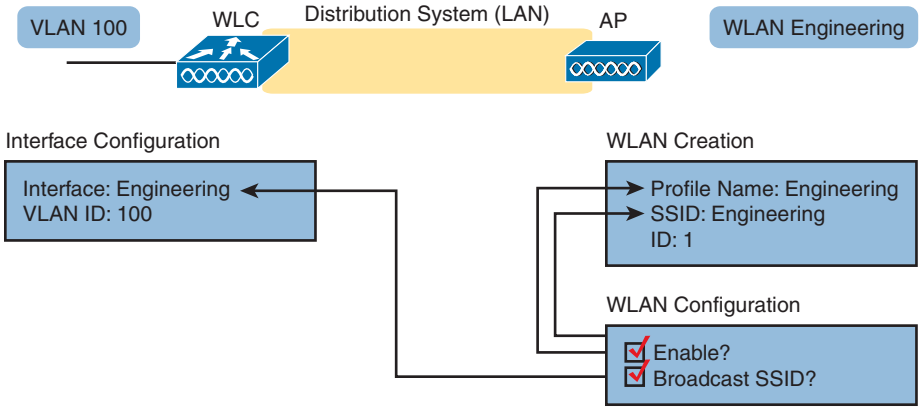

Figure B-3 *A Conceptual View of WLC WLAN Config Required Elements*

Focus on the WLAN configuration step for a moment. In the WLAN create page (Figure 29-14), you create the WLAN profile name and SSID. (The SSID defaults to be equal to the profile name.) You also choose a WLAN ID, a numeric value used internally by the WLC. (Note that the WLAN ID is not the VLAN ID.)

The WLAN configuration page that follows (Figure 29-15) prepopulates the WLAN profile name and SSID, giving you a couple of important configuration choices:

- With which interface to associate the WLAN. The interface defines the VLAN ID to use for the wireless traffic in this WLAN; the VLAN ID is configured with the dynamic interface, as seen in Figures 29-10 and 29-11.
- Whether to enable the WLAN. If not enabled, no one can use the WLAN.

- Whether to broadcast the SSID when sending beacon frames. In most cases, you check this box so that users can learn that the WLAN exists. If not checked, users would not dynamically learn of the existence of the WLAN.

Most importantly, to connect the WLAN (the wireless side) with a VLAN (the wired side), the WLAN configuration page must refer to the correct dynamic interface. You do this on the WLAN configuration page (Figure 29-15), linking to the interface name. The interface configuration (refer to Figure 29-11) then defines the associated VLAN ID.

Summarizing for easier study, the following list notes the required steps to configure a WLAN from WLC. You first plan the settings, and then configure these values:

1. Create and configure a dynamic interface, assigning both an interface name and a VLAN ID.
2. Create a WLAN, assigning both a WLAN profile name and an SSID, along with a unique WLAN ID.
3. Configure the WLAN check boxes to enable the VLAN and broadcast the SSID.

For reference, Table B-2 provides some conventions for the values used when configuring a WLAN in WLC. Note that the text fields support alphanumeric and most special keyboard characters.

Table B-2 WLAN Configuration Fields and Formats

Vol 1 Figure	Field	Data Format	Values
29-11	Interface Name	ASCII	Text, max length 31
29-11	VLAN ID	Decimal	1–1001, 1007–4094
29-14	Profile Name	ASCII	Text, max length 32
29-14	SSID	ASCII	Text, max length 32
29-14	WLAN ID	Decimal	1–512

WPA2 PSK Formats

As another exercise, consider again the Layer 2 security configuration process from the WLC. To begin, review the wording of the one CCNA exam topic in the CCNA 200-301 Version 1.0 blueprint that mentions configuration and verification of WLANs:

5.10 Configure and verify WLAN within the GUI using **WPA2 PSK**

The exam topic terms *WPA2* and *PSK* imply several of the correct choices to make once you reach the WLC Layer 2 security configuration page. That page has the input box in which you can type the PSK value, but it also has other choices and values suggested by the exam topic. This exercise works through the WLC Layer 2 security configuration page shown in Figure 29-16, but using Figure B-4, which repeats Figure 29-16 but with notations about step numbers from an upcoming list.

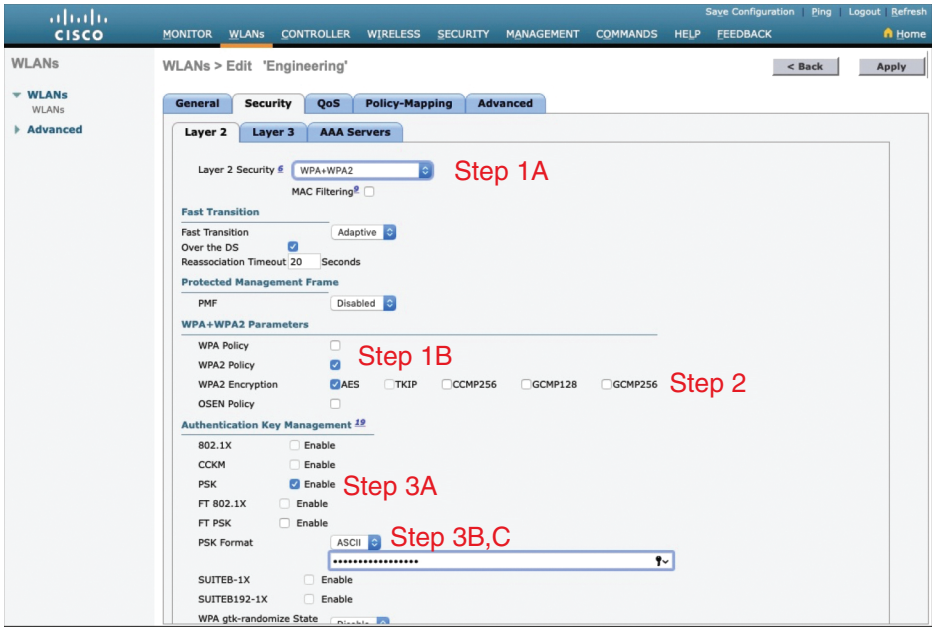

Figure B-4 *Repeat of Figure 29-16 with Step References Added*

The following list explains the specific choices on the page that result from the exam topic, limiting the discussion to the use of WPA2 with PSK:

Step 1. To choose WPA2 per the exam topic, take two actions:

- **Step 1A.** Choose the WPA+WPA2 option from the Layer 2 Security Options pull-down menu.
- **Step 1B.** Choose WPA2 only by checking the WPA2 box but not checking the WPA box.

Step 2. Choose one of the WPA2 encryption options (avoiding TKIP per Chapter 28).

Step 3. Per the exam topic reference to PSK (Pre-Shared Key), you should

- **Step 3A.** Check the PSK Enable box.
- **Step 3B.** Choose a data format for the PSK (ASCII shown).
- **Step 3C.** Type the value for the PSK.

As for the actual values of the PSK, Figure B-4 shows the chosen format as ASCII but with the key value hidden (shown as dots). The user interface does not show the key for security reasons. Also, note that the ASCII key must range from 8–63 characters in length. When using a hexadecimal key, the length is 64 digits.