CBTnuggets

CCNA® Study Guide

Exam 200-301

Table of Contents

Welcome!

The study guide is separated into sections to help you more easily navigate. You can click a link in the Table of Contents to reach each section associated with one of the six CCNA® 200-301 exam topics.

Getting started

This is where your journey begins! In this section, you will start by registering for your exam. Scroll down to the next page when you're ready to get started!

Labs

Our CBT Nuggets CCNA course has virtual labs that provide you with hands-on practice in a virtual environment. To launch a virtual lab, sign in to your CBT Nuggets account and navigate to the CCNA course page. Not all videos come with a virtual lab, but the ones that do will have a Launch Virtual Lab button you can click whenever you'd like to launch a lab. Clicking this button will open a new window, indicating your lab is being built. Once your lab launches, you can follow along with the trainer in your virtual lab. Please note that only one virtual lab can be active at a time. Attempting to launch a second lab will end your previous lab session.

Learn more about **Virtual Labs**.

Ready to get started?

Here are a few resources to help you move forward right now!

Sign up for a Pearson Vue account to register for Cisco® exams.

You can review **Cisco® Certification Exam Policies** here.

Additional resources to help with understanding.

CCNA® 200-301 Official Cert Guide®, Volume 1

CCNA® 200-301 Official Cert Guide®, Volume 2

CBT Nuggets is not a direct partner or affiliate of Cisco®. We suggest the Cisco® Official Cert Guide® as a great resource to supplement top your video training.

Develop your study routine!

Here are a few resources to help you move forward right now!

- Schedule your study space and time!
  - Clear a comfortable quiet place to relax and study each time you study.
  - Aim for the same time each day.
  - For better retention, it is suggested that you start by studying for one hour each day and increase the amount of time as needed.
  - Experiment with your new study routine. Block off one-hour for total study time for each day.
  - Within each hour-long block, create two blocks of 30 minutes.
  - Now separate the thirty-minute block into 25 minutes for studying and 5 minutes for taking a break.
  - This will help prevent burnout.
- Now you're ready to start learning!
  - For the next 25 minutes study the resource you want to focus on.
  - When the timer sounds, take a five-minute break!
  - Make sure you detach yourself from your study space by walking away!
  - This will give your mind something else to focus on and refresh you for the next round of studying!
  - At the end of the five-minute break begin a new 30-minute block!
- Move to the next Study Plan when you understand the information.
- Post a message in the **CBT Nuggets Learner Community** *#ask-a-mentor* channel for help!

CCNA® STUDY GUIDE

Network Fundamentals | Exam 200-301

Cisco® 200-301 Exam Topic

1 Network Fundamentals

1.1 Explain the role and function of network components

1.2 Describe the characteristics of network topology architectures

1.3 Compare physical interface and cabling types

1.4 Identify interface and cable issues (collisions, errors, mismatch duplex, and/or speed)

1.5 Compare TCP to UDP

1.6 Configure and verify IPv4 addressing and subnetting

1.7 Describe the need for private IPv4 addressing

1.8 Configure and verify IPv6 addressing and prefix

1.9 Compare IPv6 address types

1.10 Verify IP parameters for Client OS (Windows, Mac OS, Linux)

1.11 Describe wireless principles

1.12 Explain virtualization fundamentals (virtual machines)

1.13 Describe switching concepts

CCNA® STUDY GUIDE

Network Fundamentals | Exam 200-301

CBT Nuggets Skills

Describe Network Functions and Equipment

Explain Network Communication Using the OSI and TCP/IP Model

Describe Common Network Architectures

Discern Copper and Fiber Optic Network Cable Characteristics

Connect and Navigate Cisco® Internetwork Operating System (IOS)

Create a Base Configuration for Cisco® Devices

Create a Base Configuration for Cisco® Devices Hands-On Lab

Wireshark Fundamentals: Capturing, Viewing, and Filtering Data

Describe and Analyze TCP and UDP Communication

Configure Windows, MAC, or Linux for Network Access

Describe Network Switch Functions and How to Locate Network Devices

Diagnose Interface Status, Errors, and Cabling Issues on a Cisco® Switch

Describe Power over Ethernet (PoE) Capabilities and Standards

Explain IP Addressing and Subnetting Concepts

Convert Decimal to Binary and Back

Perform Subnetting Based on Network Requirements

Perform Subnetting Based on Host Requirements

Reverse Engineering Subnets and Using VLSM

Describe IPv6 Core Addressing Concepts

Additional Resources

IP Addressing Notes

OCG®

Volume 1, Part 1, Chapters 1, 2, 3

Volume 2, Part 4, Chapter 13

CCNA® STUDY GUIDE

Network Access | Exam 200-301

Cisco® 200-301 Exam Topic

2 Network Access

2.1 Configure and verify VLANs (normal range) spanning multiple switches

2.2 Configure and verify interswitch connectivity

2.3 Configure and verify Layer 2 discovery protocols (Cisco® Discovery Protocol and LLDP)

2.4 Configure and verify (Layer 2/Layer 3) EtherChannel (LACP)

2.5 Describe the need for and basic operations of Rapid PVST+ Spanning Tree Protocol and identify basic operations

2.6 Compare Cisco® Wireless Architectures and AP modes

2.7 Describe physical infrastructure connections of WLAN components (AP, WLC, access/trunk ports, and LAG)

2.8 Describe AP and WLC management access connections (Telnet, SSH, HTTP, HTTPS, console, and TACACS+/RADIUS)

2.9 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

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Network Access | Exam 200-301

CBT Nuggets Skills

Design a Basic Wireless Network

Explain VLANs and Configure VLANs on a Single Switch

Configure Trunking Between Switches, WAPs, and Servers

Create a Network Diagram with Cisco® CDP and LLDP

Design and Configure a Rapid Spanning Tree Protocol (STP) Network

Increase Network Capacity Using EtherChannel

Configure a Basic Cisco® Wireless Network using the WLC GUI

Explain End-To-End IP Communications

Additional Resources

OCG®

Volume 1, Part 2, Chapters 4, 5, 6, 7

Volume 1, Part 3, Chapters 8, 9, 10

Volume 1, Part 4, Chapters 11, 12, 13, 14

Volume 1, Part 8, Chapters 26, 27, 28, 29

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IP Connectivity | Exam 200-301

Cisco® 200-301 Exam Topic

3 IP Connectivity

3.1 Interpret the components of a routing table

3.2 Determine how a router makes a forwarding decision by default

3.3 Configure and verify IPv4 and IPv6 static routing

3.4 Configure and verify single area OSPFv2

3.5 Describe the purpose of first-hop redundancy protocol

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IP Connectivity | Exam 200-301

CBT Nuggets Skills

Configure and Verify Cisco® IPv4 Static Routes

Configure and Verify Cisco® IPv6 Static Routes

Describe Cisco® Dynamic IPv4 Routing with OSPF

Implement Cisco® Dynamic IPv4 Routing with OSPF

Configure and Verify First Hop Redundancy Protocols (FHRP)

Interpret and Describe a Cisco® IP Routing Table

Predict a Cisco® Router's IP Forwarding Decisions

Configure and Verify Cisco®'s Router on a Stick

Additional Resources

OCG®

Volume 1, Part 5, Chapters 15, 16, 17, 18

Volume 1, Part 6, Chapters 19, 20, 21

Volume 1, Part 7, Chapters 22, 23, 24, 25

Volume 2, Part 3, Chapter 12

CCNA® STUDY GUIDE

IP Services | Exam 200-301

Cisco® 200-301 Exam Topic

4 IP Services

4.1 Configure and verify inside source NAT using static and pools

4.2 Configure and verify NTP operating in a client and server mode

4.3 Explain the role of DHCP and DNS within the network

4.4 Explain the function of SNMP in network operations

4.5 Describe the use of syslog features including facilities and levels

4.6 Configure and verify DHCP client and relay

4.7 Explain the forwarding per-hop behavior (PHB) for QoS such as classification, marking, queuing, congestion, policing, shaping

4.8 Configure network devices for remote access using SSH

4.9 Describe the capabilities and function of TFTP/FTP in the network

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IP Services | Exam 200-301

CBT Nuggets Skills

Troubleshoot an IP Network

Cisco® NAT Concepts and Base Configurations: Static and Overload

Configure and Verify Cisco® NTP

Configure DHCP Server and Relay Functions

Explain Common Network Services: SNMP, Syslog, QoS, and TFTP-FTP

Additional Resources

OCG®

Volume 1, Part 3, Chapters 9, 10, 11

CCNA® STUDY GUIDE

Security Fundamentals | Exam 200-301

Cisco® 200-301 Exam Topic

5 Security Fundamentals

5.1 Define key security concepts (threats, vulnerabilities, exploits, and mitigation techniques)

5.2 Describe security program elements (user awareness, training, and physical access control)

5.3 Configure device access control using local passwords

5.4 Describe security password policies elements, such as management, complexity, and password alternatives (multi factor authentication, certificates, and biometrics)

5.5 Describe remote access and site-to-site VPNs

5.6 Configure and verify access control lists

5.7 Configure Layer 2 security features (DHCP snooping, dynamic ARP inspection, and port security)

5.8 Differentiate authentication, authorization, and accounting concepts

5.9 Describe wireless security protocols (WPA, WPA2, and WPA3)

5.10 Configure WLAN using WPA2 PSK using the GUI

CCNA® STUDY GUIDE

Security Fundamentals | Exam 200-301

CBT Nuggets Skills

Define Key Concepts Regarding Network Security

Describe Security Program Elements

Describe Elements of Secure Password Policies

Configure Cisco® Device Access Control Using Local Passwords

Summarize and Differentiate AAA Concepts

Apply and Verify Cisco® Access Control Lists

Configure and Verify Cisco® Port Security

Configure and Verify Cisco® DHCP Snooping

Configure and Verify Cisco® Dynamic ARP Inspection

Describe Remote Access and Site-to-Site VPNs

Describe, Configure, and Verify Wireless Security protocols

Additional Resources

OCG®

Volume 2, Part 1, Chapters 1, 2, 3

Volume 2, Part 2, Chapters 4, 5, 6, 7, 8

Volume 2, Part 4, Chapters 14

CCNA® STUDY GUIDE

Automation and Programmability | Exam 200-301

Cisco® 200-301 Exam Topic

6 Automation and Programmability

6.1 Explain how automation impacts network management

6.2 Compare traditional networks with controller-based networking

6.3 Describe controller-based and software defined architectures (overlay, underlay, and fabric)

- 6.3.a Separation of control plane and data plane
- 6.3.b North-bound and south-bound APIs

6.4 Compare traditional campus device management with Cisco® DNA Center enabled device management

6.5 Describe characteristics of REST-based APIs (CRUD, HTTP verbs, and data encoding)

6.6 Recognize the capabilities of configuration management mechanisms Puppet, Chef, and Ansible

6.7 Interpret JSON encoded data

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Automation and Programmability | Exam 200-301

CBT Nuggets Skills

What is Network Automation?

Use REST APIs and JSON

Controller-Based Networking

Network Automation Tools: Ansible, Puppet, and Chef

Additional Resources

OCG®

Volume 2, Part 4, Chapter 15

Volume 2, Part 5, Chapters 16, 17, 18, 19

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Appendix | Exam 200-301

Appendix

CCNA® STUDY GUIDE

IPv4 Subnetting notes | Exam 200-301

IPv4 Subnetting notes

Reverse engineering values chart								
Bits	1	2	3	4	5	6	7	8
Value	128	64	32	16	8	4	2	1
Mask	.128	.192	.224	.240	.248	.252	.254	.255

Default: IP Address Ranges, Masks, and CIDR		
Address Class	Default Masks	CIDR Classless Inter-Domain Routing
Class A (1-126)	255.0.0.0	/8
Class B (128-191)	255.255.0.0	/16
Class C (192-223)	255.255.255.0	/24

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IPv4 Subnetting notes | Exam 200-301

Powers of 2

Powers of 2 are critical to finding Block Size and other information. Complete this chart at least one time to help you memorize the powers of 2 up to 2^16.

Power	Answer	Power	Answer	Power	Answer	Power	Answer
2^1		2^5	32	2^9		2^13	
2^2		2^6		2^10		2^14	
2^3		2^7		2^11		2^15	
2^4		2^8	256	2^12	4096	2^16	65536

Subnet Mask Big Picture

Complete this chart one time! This can help you remember the different ways of expressing the subnet mask and network/host values.

CIDR	Subnet Mask	Binary	Number of Networks (2^n)	Number of Hosts (2^h-2)
/8	255.0.0.0	11111111.00000000. 00000000.00000000	Networks (2^8) 256	Hosts (2^24-2) 16,777,214
/9				
/10				
/11				
/12			4,096	
/13			8,192	
/14				

Subnet Mask Big Picture continued

CIDR	Subnet Mask	Binary	Number of Networks (2^n)	Number of Hosts (2^h-2)
/15				
/16	255.255.0.0	11111111.11111111. 00000000.00000000		
/17				
/18				
/19				
/20				
/21				
/22				
/23				
/24		11111111.11111111. 11111111.00000000	16,777,216	254
/25		11111111.11111111. 11111111.10000000		
/26				
/27				
/28				
/29				
/30				
/31				
/32				

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IPv6 Addresses | Exam 200-301

IPv4 Addresses vs IPv6 Addresses

Deployed	1981	1999
Address size	32 bit number	128 bit number
Address format	Dotted Decimal Notation: 192.149.252.76	Hexadecimal Notation: 3FFE:F200:0234:AB00:0123: 4567:8901:ABCD
Prefix notation (network address)	192.146.0.0/24	3FFE:F200:0234::/48
Possible addresses	4,300,000,000 (4.3 Billion)	340,282,366,920,938,463,436, 374,607,431,768,211,456 340 Undecillion 340 Trillion Trillion Trillion

IPv6b Link-Local Address Breakdown

FE80:	0000:	0000:	0000:	BAE8:	56FF:	FE4A:	ECFE
10 Bits	54 bits			64 Bits			

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IPv6 Addresses | Exam 200-301

IPv6 Segments Breakdown

Global Routing Prefix 48 Bits			Subnet ID 16 Bits	Interface ID 64 Bits			
2001:	0DB8:	0234:	AB00:	0123:	4567:	8901:	ABCD
2 Global unicast Address Indicator	0DB8 ISP	0234 Customer	AB00 Subnet	64 bit EUI			
001 Region							

IPv6 Address Shortening

2001:	**0DB8:**	**7AAB:**	**0008:**	**0000:**	**0000:**	**A573:**	**2618**
Segment 1 16 bits	Segment 2 16 bits	Segment 3 16 bits	Segment 4 16 bits	Segment 5 16 bits	Segment 6 16 bits	Segment 7 16 bits	Segment 8 16 bits
2001:	**0DB8:**	**7AAB:**	**0008:**	**:**	**:**	**:A573**	**:2618**
	Leading Zeros		Leading Zeros	All Zeros	All Zeros		
2001:	**0DB8:**	**7AAB:**	**8:**	**:**	**:**	**:A573**	**:2618**

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IPv6 Addresses | Exam 200-301

Binary to Hexadecimal Conversion

Fill in the incomplete chart on the right from memory.

Binary	Hexadecimal
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

Binary	Hexadecimal
0000	0
	F
0010	
	D
	3
	A
1110	
	6
0111	
	4
	1
	9
1100	
0101	
	8
1011	