CCIE Collaboration Unified Exam Topics v2.0

The Cisco CCIE® Collaboration version 2.0 exam unifies written and lab exam topics into a unique curriculum, while explicitly disclosing which domains pertain to which exam, and the relative weight of each domain.

The Cisco CCIE Collaboration Written Exam (400-051) version 2.0 is a two-hour test with 90–110 questions that validate professionals who have the expertise to describe, design, implement, operate, and troubleshoot complex enterprise collaboration solutions. The exam is closed book and no outside reference materials are allowed.

The Cisco CCIE Collaboration Lab Exam version 2.0 is an eight-hour, hands-on exam that requires a candidate to plan, design, implement, operate, and troubleshoot complex enterprise collaboration solutions for a given specification. Knowledge of troubleshooting is an important skill and candidates are expected to diagnose and solve issues as part of the CCIE lab exam.

The following topics are general guidelines for the content likely to be included on the exam. However, other related topics may also appear on any specific delivery of the exam. In order to better reflect the contents of the exam and for clarity purposes, the guidelines below may change at any time without notice.

NOTE: This CCIE Collaboration written exam topics version 2.0 includes Evolving Technologies v1.1 domain and should be referenced for written exams scheduled on August 30, 2018 and beyond.

Domain Number	Domain	Written Exam Percentage (%)	Lab Exam Percentage (%)
1.0	Protocols and APIs	12	12
2.0	Infrastructure and Quality of Services	10	11
3.0	Call Control and Dial plan	20	24
4.0	Endpoints, User Management, and Mobility	10	10
5.0	Edge Services	16	18
6.0	Media Resources, Meetings, and Call Recording	12	12
7.0	Collaboration Applications	10	13
8.0	Evolving Technologies	10	N/A
	Total %	100	100

1.0   Protocols and APIs

      1.1.   Capture, analyze, and troubleshoot IP collaboration signaling protocols

            1.1.a.   SIP

       1.1.b.   H.323

       1.1.c.   MGCP

       1.1.d.   SCCP

1.2.   Implement and troubleshoot SDP and media negotiation

       1.2.a.   Offer/Answer model

       1.2.b.   Early offer, delayed offer, early media

       1.2.c.   Payload type interworking

1.3.   Analyze and troubleshoot SIP identity headers

       1.3.a.   Name

       1.3.b.   Number

       1.3.c.   URI

       1.3.d.   Privacy

1.4.   Capture, analyze, and troubleshoot media protocols

       1.4.a.   RTP/RTCP, sRTP/sRTCP

       1.4.b.   Binary Floor Control Protocol (BFCP)

       1.4.c.   ActiveControl (iX)

       1.4.d.   T.38

1.5.   Design, implement, and troubleshoot DTMF relay

       1.5.a.   In-band vs out-of-band

       1.5.b.   RFC 2833

       1.5.c.   Key Pad Markup Language (KPML)

       1.5.d.   Unsolicited NOTIFY

       1.5.e.   Interworking

1.6.   Capture, analyze, and troubleshoot messaging protocols

       1.6.a.   XMPP

       1.6.b.   SIP/SIMPLE

1.7.   Capture, analyze, and troubleshoot legacy telephony protocols

       1.7.a.   Analog (FXS, FXO, loop-start, ground-start)

       1.7.b.   Q.931

1.8.   Utilize and troubleshoot the following APIs

       1.8.a.   Cisco Meeting Server API

       1.8.b.   Unified CM Administrative XML (AXL) API

       1.8.c.   Spark API

       1.8.d.   Tropo API

1.9.   Describe the functionality of the following APIs

       1.9.a.   Cisco Unity Connection Provisioning Interface (CUPI)

       1.9.b.   Java Telephony Application Programming Interface (JTAPI)

       1.9.c.   Extension Mobility API (EMAPI)

       1.9.d.   UC Gateway Services API (GSAPI)

       1.9.e.   Unified Routing Rules XML Interface (CURRI)

2.0   Infrastructure and Quality of Services

2.1.   Implement and troubleshoot network services

       2.1.a.   DHCP

       2.1.b.   NTP

       2.1.c.   DNS

       2.1.d.   CDP/LLDP

2.2.   Troubleshoot layer 2 and layer 3 network connectivity issues

2.3.   Identify key implications of running collaboration in a wireless environment

      2.3.a.   802.11k, 802.11v, 802.11r

      2.3.b.   QoS

2.4.   Design, implement, and troubleshoot Quality of Service for Collaboration applications and endpoints on LAN/WAN/WLAN (Cisco IOS-XE and AireOS)

      2.4.a.   Identification

      2.4.b.   Classification and marking

      2.4.c.   Queuing and scheduling

      2.4.d.   Congestion management

2.5.   Troubleshoot voice and video quality issues

      2.5.a.   Packet loss, jitter, and latency

      2.5.b.   Endpoint call quality metrics

      2.5.c.   One-way or no-way media

2.6.   Collect and analyze packet captures on Cisco Collaboration platforms

2.7.   Design, implement, and troubleshoot Enhanced Locations Call Admission Control (ELCAC)

2.8.   Design, implement, and troubleshoot Call Admission Control on CUBE

2.9.   Describe APIC-EM integration with Cisco Collaboration solutions

2.10.   Design, implement, and troubleshoot Collaboration applications in a virtualized environment

      2.10.a.   Virtual machine templates

      2.10.b.   Hypervisors

      2.10.c.   Resource utilization (CPU, memory, storage, network)

3.0   Call Control and Dial plan

3.1.   Design and analyze global dial plans

      3.1.a.   Localization and globalization

      3.1.b.   Numbering schemes

      3.1.c.   Dialing habits

      3.1.d.   Interdigit timeouts

      3.1.e.   Calling privileges

      3.1.f.   Number presentation

3.2.   Design, implement, and troubleshoot fundamental dial plan features on Unified CM

      3.2.a.   Partitions and calling search spaces

      3.2.b.   Translation and transformation patterns

      3.2.c.   Urgent priority

      3.2.d.   Path selection

      3.2.e.   AAR

3.3.   Design, implement, and troubleshoot advanced dial plan features on Unified CM

      3.3.a.   Global dial plan replication

      3.3.b.   Local route groups

3.4.   Design, implement, and troubleshoot URI and domain-based routing

3.5.   Implement and troubleshoot Unified CM telephony features

      3.5.a.   Call Pickup

      3.5.b.   Barge/privacy

      3.5.c.   Native call queuing

      3.5.d.   Intercom

      3.5.e.   Music on hold (unicast and multicast)

3.6.   Design, implement, and troubleshoot audio and video codec selection

3.7.   Implement and troubleshoot SIP trunking

3.7.a.   SIP profiles
3.7.b.   SIP trunk security profiles
3.7.c.   Resiliency
3.7.d.   Mid-call signaling
3.8.   Implement and troubleshoot UDS in a multi-cluster environment
3.8.a.   Service discovery
3.8.b.   User search
3.8.c.   LDAP proxy
3.9.   Verify and troubleshoot Unified CM database replication
3.10.   Design, implement, and troubleshoot dial plans on Cisco IOS-XE
3.10.a. Inbound and outbound dial-peers
3.10.b. Voice translation rules and profiles
3.10.c. Dial-peer provisioning policy
3.10.d. Destination server groups
3.10.e. Destination dial-peer groups
3.10.f.   E.164 pattern maps
3.10.g. URI-based dialing
3.10.h. VRF-aware call routing
3.11.   Implement and troubleshoot SIP call control for Unified CME
3.11.a. Extension Assigner
3.11.b. Secondary CME support
3.11.c. Video support
3.11.d. Telephony features
3.12.   Implement and troubleshoot SIP-SRST and E-SRST
3.13.   Design, implement, and troubleshoot dial plans on Expressway Series
3.13.a. Transforms
3.13.b. Search rules
3.13.c. Zones
3.13.d. Subzones
3.14.   Implement and troubleshoot Cisco Spark Services
3.14.a. Extending cloud services using on premise resources
3.14.b. Cloud service management

4.0   Endpoints, User Management, and Mobility
4.1.   Implement and troubleshoot hardware and software endpoint registration in a multi-cluster environment
4.1.a.   On-premise (local or proxy TFTP)
4.1.b.   Mobile and Remote Access (Service Discovery)
4.1.c.   Cloud
4.2.   Implement and troubleshoot mixed mode and Security By Default (SBD) on Unified CM
4.2.a.   Certificate Trust List (CTL) and Identity Trust List (ITL)
4.2.b.   Token and token-less
4.2.c.   Trust Verification Service (TVS)
4.3.   Implement collaboration endpoints and infrastructure using IPv6
4.4.   Implement and troubleshoot endpoint features
4.4.a.   Proximity
4.4.b.   Directory integration and search
4.4.c.   Product specific configurations

           4.4.d.   Multistream
4.5.   Integrate and troubleshoot LDAP synchronization and authentication
           4.5.a.   On-premise
           4.5.b.   Cloud
4.6.   Integrate and troubleshoot Single-Sign-On (SSO)
4.7.   Implement and troubleshoot self-provisioning
4.8.   Implement and troubleshoot mobility features
           4.8.a.   Mobile Connect (Single Number Reach)
           4.8.b.   Device Mobility
           4.8.c.   Mobile Identity
           4.8.d.   Extend and Connect
4.9.   Implement and troubleshoot Extension Mobility Cross Cluster (EMCC)
           4.9.a.   Emergency dialing considerations
           4.9.b.   Certificate exchange

5.0   Edge Services

5.1.   Implement and troubleshoot ISDN PRI gateways
5.2.   Implement and troubleshoot SIP trunks in a multi-tenant environment
           5.2.a.   Authentication
           5.2.b.   Multi-VRF SIP trunks
5.3.   Implement and troubleshoot SIP normalization and SDP normalization
           5.3.a.   Normalization and transparency scripts (Lua)
           5.3.b.   Cisco IOS-XE SIP profiles
5.4.   Implement and troubleshoot encrypted signaling and media on trunks
5.5.   Implement and troubleshoot stateful box-to-box redundancy on CUBE (Cisco IOS-XE)
5.6.   Implement and troubleshoot network and application level security on Cisco IOS-XE
           5.6.a.   IP Trust List
           5.6.b.   Call spike protection
           5.6.c.   Media policing
           5.6.d.   Call thresholds
           5.6.e.   RTP port ranges
           5.6.f.   Telephony denial of service attacks
5.7.   Design, analyze, and troubleshoot firewall traversal in a Collaboration solution
           5.7.a.   Port numbers and transport
           5.7.b.   NAT
           5.7.c.   Proxy servers
           5.7.d.   Deep Packet Inspection considerations
           5.7.e.   Trusted Relay Point
           5.7.f.   Interactive Connectivity Establishment (ICE)
5.8.   Implement and troubleshoot Expressway Series traversal communications
           5.8.a.   Traversal zone
           5.8.b.   SSH tunnels
5.9.   Implement and troubleshoot Mobile and Remote Access (MRA)
5.10.   Implement and troubleshoot network and application level security on Expressway Series
           5.10.a. Toll fraud prevention (CPL)
           5.10.b. Zone and subzone authentication
           5.10.c. Automated intrusion protection
           5.10.d. Mutual TLS

5.11.   Implement and troubleshoot call routing for Spark hybrid services and Business-to-Business (B2B) calling

5.12.   Implement and troubleshoot Spark hybrid service connectors and containers

5.13.   Implement and troubleshoot third-party interoperability and federation

     5.13.a. Voice and video calling

     5.13.b. IM&P

6.0   Media Resources, Meetings, and Call Recording

6.1.   Design, implement, and troubleshoot media resources

     6.1.a.   Transcoding and transrating

     6.1.b.   MTP

6.2.   Implement and troubleshoot rendezvous conferencing

     6.2.a.   Unified CM Conference Now

     6.2.b.   Cisco Meeting Server Spaces

6.3.   Implement and troubleshoot ad-hoc conferencing

     6.3.a.   Cisco IOS-XE conferencing

     6.3.b.   Cisco Meeting Server

     6.3.c.   Cloud

6.4.   Implement and troubleshoot scheduled meetings

     6.4.a.   On-premise

     6.4.b.   Hybrid

     6.4.c.   Cloud

6.5.   Implement and troubleshoot CallBridge and WebBridge on Cisco Meeting Server

     6.5.a.   Internal user access

     6.5.b.   External user access

6.6.   Implement and troubleshoot high availability on Cisco Meeting Server

6.7.   Design, implement, and troubleshoot audio and video call recording architectures

     6.7.a.   Open Recording Architecture (ORA)

     6.7.b.   SIP-based Media Recording (SIPREC)

     6.7.c.   Network-Based Recording (gateway preferred)

     6.7.d.   Built-in bridge

     6.7.e.   Cisco Meeting Server

7.0   Collaboration Applications

7.1.   Implement and troubleshoot on premise IM&P servers and clients

7.2.   Implement and troubleshoot presence

     7.2.a.   Busy Lamp Field (BLF)

     7.2.b.   Soft client

     7.2.c.   Cloud

7.3.   Integrate IM&P server with external database to enable Persistent Chat and Group Chat

7.4.   Implement and troubleshoot voicemail integration

     7.4.a.   Cisco Unity Connection

     7.4.b.   Virtual Cisco Unity Express (vCUE)

7.5.   Implement and troubleshoot voicemail features

     7.5.a.   Call and directory handlers

     7.5.b.   Voicemail access from soft clients

     7.5.c.   Video greetings and messaging

7.6.   Implement and troubleshoot voicemail dial plan

     7.6.a.   Partitions and search spaces

          7.6.b.   Routing rules

7.7.   Implement and troubleshoot voicemail digital networking

7.8.   Design, implement, and troubleshoot Cisco Unified Contact Center Express (UCCX)

          7.8.a.   Integration

          7.8.b.   Scripting

7.9.   Implement and troubleshoot Contact Center agent desktop (Finesse)

8.0   Evolving Technologies v1.1

8.1   Cloud

      8.1.a   Compare and contrast public, private, hybrid, and multicloud design considerations

          8.1.a (i)   Infrastructure, platform, and software as a service (XaaS)

          8.1.a (ii)   Performance, scalability, and high availability

          8.1.a (iii)   Security implications, compliance, and policy

          8.1.a (iv)   Workload migration

      8.1.b   Describe cloud infrastructure and operations

          8.1.b (i)   Compute virtualization (containers and virtual machines)

          8.1.b (ii)   Connectivity (virtual switches, SD-WAN and SD-Access)

          8.1.b (iii)   Virtualization functions (NFVi, VNF, and L4/L8)

          8.1.b (iv)   Automation and orchestration tools (CloudCenter, DNA-center, and Kubernetes)

8.2   Network programmability (SDN)

      8.2.a   Describe architectural and operational considerations for a programmable network

          8.2.a (i)   Data models and structures (YANG, JSON and XML)

          8.2.a (ii)   Device programmability (gRPC, NETCONF and RESTCONF)

          8.2.a (iii)   Controller based network design (policy driven configuration and northbound/ southbound APIs)

          8.2.a (iv)   Configuration management tools (agent and agentless) and version control systems (Git and SVN)

8.3   Internet of things (IoT)

      8.3.a   Describe architectural framework and deployment considerations for IoT

          8.3.a (i)   IoT technology stack (IoT Network Hierarchy, data acquisition and flow)

          8.3.a (ii)   IoT standards and protocols (characteristics within IT and OT environment)

          8.3.a (iii)   IoT security (network segmentation, device profiling, and secure remote access)

          8.3.a (iv)   IoT edge and fog computing (data aggregation and edge intelligence)