

Q Project CCNA Lab Event Proposal

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Q Project

Q Project's main goal is to create a diverse inclusive learning environment to **all** UC Merced students, **giving them skills to use in the future and in their careers**, no matter their major, sexual orientation, gender, origin, race, or socioeconomic status.

Past Funding

- No funding from ASUCM since COVID (Spring/Fall 2020)
- Limited funding for our weekly Cyber Security Workshops from Vice Chancellor Charles Nies
 - Open to UC Merced students and published on youtube (SINCE BEG of COVID)

CCNA

- Cisco Certified Network Associate
 - Certification Exam
- Benefits:
 - High regarded in the IT industry field
 - Starting salary with JUST CCNA = \$75K
 - Myriad of industry-ready skills



Top Skills Obtained From CCNA

- Understand how different network topologies interact to form a **secure IT network**
- **Explain how a computer network works** and how it interacts with networked devices
- **Configure, verify and troubleshoot a switch** with VLAN & interswitch communications
- **Implement an IP addressing scheme** and IP Services to meet specific network requirements
- **Configure, verify and troubleshoot routing** and router operations on current Cisco devices
- Identify network security threats and **describe threat mitigation methods & countermeasures**
- Describe and perform the appropriate tasks for wireless local area network (**WLAN**) **administration**
- **Setup and verify WAN links** and execute the proper methods for connecting to a wide area network
- **Implement & support** Network Address Translation (NAT) and Access Control Lists (ACLs) in branch office networks

Actual Skills

Network Fundamentals

Compare and contrast OSI and TCP/IP models

Compare and contrast TCP and UDP protocols

Describe the impact of infrastructure components in an enterprise network

- 1.3.a Firewalls
- 1.3.b Access points
- 1.3.c Wireless controllers

Describe the effects of cloud resources on enterprise network architecture

- 1.4.a Traffic path to internal and external cloud services
- 1.4.b Virtual services
- 1.4.c Basic virtual network infrastructure

Compare and contrast collapsed core and three-tier architectures

Compare and contrast network topologies

- 1.6.a Star
- 1.6.b Mesh
- 1.6.c Hybrid

Select the appropriate cabling type based on implementation requirements

Apply troubleshooting methodologies to resolve problems

- 1.8.a Perform and document fault isolation
- 1.8.b Resolve or escalate
- 1.8.c Verify and monitor resolution

Configure, verify, and troubleshoot IPv4 addressing and subnetting

Compare and contrast IPv4 address types

- 1.10.a Unicast
- 1.10.b Broadcast
- 1.10.c Multicast

Describe the need for private IPv4 addressing

Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment

Configure, verify, and troubleshoot IPv6 addressing

Configure and verify IPv6 Stateless Address Auto Configuration

Compare and contrast IPv6 address types

- 1.15.a Global unicast
- 1.15.b Unique local
- 1.15.c Link local
- 1.15.d Multicast
- 1.15.e Modified EUI 64
- 1.15.f Autoconfiguration
- 1.15.g Anycast

LAN Switching Technologies

Describe and verify switching concepts

- 2.1.a MAC learning and aging
- 2.1.b Frame switching
- 2.1.c Frame flooding
- 2.1.d MAC address table

Interpret Ethernet frame format

Troubleshoot interface and cable issues (collisions, errors, duplex, speed)

Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multiple switches

- 2.4.a Access ports (data and voice)
- 2.4.b Default VLAN

Configure, verify, and troubleshoot interswitch connectivity

- 2.5.a Trunk ports
- 2.5.b Add and remove VLANs on a trunk
- 2.5.c DTP, VTP (v1&v2), and 802.1Q
- 2.5.d Native VLAN

Configure, verify, and troubleshoot STP protocols

- 2.6.a STP mode (PVST+ and RPVST+)
- 2.6.b STP root bridge selection

Configure, verify and troubleshoot STP related optional features

- 2.7.a PortFast
- 2.7.b BPDU guard

Configure and verify Layer 2 protocols

- 2.8.a Cisco Discovery Protocol
- 2.8.b LLDP

Configure, verify, and troubleshoot (Layer 2/Layer 3) EtherChannel

- 2.9.a Static
- 2.9.b PAGP
- 2.9.c LACP

Describe the benefits of switch stacking and chassis aggregation

Routing Technologies

Describe the routing concepts

- 3.1.a Packet handling along the path through a network
- 3.1.b Forwarding decision based on route lookup
- 3.1.c Frame rewrite

Interpret the components of a routing table

- 3.2.a Prefix
- 3.2.b Network mask
- 3.2.c Next hop
- 3.2.d Routing protocol code
- 3.2.e Administrative distance
- 3.2.f Metric
- 3.2.g Gateway of last resort

Describe how a routing table is populated by different routing information sources

- 3.3.a Admin distance

Configure, verify, and troubleshoot inter-VLAN routing

- 3.4.a Router on a stick
- 3.4.b SVI

Compare and contrast static routing and dynamic routing

Compare and contrast distance vector and link state routing protocols

Compare and contrast interior and exterior routing protocols

Configure, verify, and troubleshoot IPv4 and IPv6 static routing

- 3.8.a Default route
- 3.8.b Network route

Actual Skills cont.

- 3.8.c Host route
- 3.8.d Floating static

Configure, verify, and troubleshoot single area and multi-area OSPFv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

Configure, verify, and troubleshoot single area and multi-area OSPFv3 for IPv6 (excluding authentication, filtering, manual summarization, redistribution, stub, virtual-link, and LSAs)

Configure, verify, and troubleshoot EIGRP for IPv4 (excluding authentication, filtering, manual summarization, redistribution, stub)

Configure, verify, and troubleshoot EIGRP for IPv6 (excluding authentication, filtering, manual summarization, redistribution, stub)

Configure, verify, and troubleshoot RIPv2 for IPv4 (excluding authentication, filtering, manual summarization, redistribution)

Troubleshoot basic Layer 3 end-to-end connectivity issues

WAN Technologies

Configure and verify PPP and MLPPP on WAN interfaces using local authentication

Configure, verify, and troubleshoot PPPoE client-side interfaces using local authentication

Configure, verify, and troubleshoot GRE tunnel connectivity

Describe WAN topology options

- 4.4.a Point-to-point
- 4.4.b Hub and spoke
- 4.4.c Full mesh
- 4.4.d Single vs dual-homed

Describe WAN access connectivity options

- 4.5.a MPLS
- 4.5.b Metro Ethernet
- 4.5.c Broadband PPPoE
- 4.5.d Internet VPN (DMVPN, site-to-site VPN, client VPN)

Configure and verify single-homed branch connectivity using eBGP IPv4 (limited to peering and route advertisement using Network command only)

Describe basic QoS concepts

- 4.7.a Marking

- 4.7.b Device trust
- 4.7.c Prioritization
 - 4.7.c. (i) Voice
 - 4.7.c. (ii) Video
 - 4.7.c. (iii) Data
- 4.7.d Shaping
- 4.7.e Policing
- 4.7.f Congestion management

Infrastructure Services

Describe DNS lookup operation

Troubleshoot client connectivity issues involving DNS

Configure and verify DHCP on a router (excluding static reservations)

- 5.3.a Server
- 5.3.b Relay
- 5.3.c Client
- 5.3.d TFTP, DNS, and gateway options

Troubleshoot client- and router-based DHCP connectivity issues

Configure, verify, and troubleshoot basic HSRP

- 5.5.a Priority
- 5.5.b Preemption
- 5.5.c Version

Configure, verify, and troubleshoot inside source NAT

- 5.6.a Static
- 5.6.b Pool
- 5.6.c PAT

Configure and verify NTP operating in a client/server mode

Infrastructure Security

Configure, verify, and troubleshoot port security

- 6.1.a Static
- 6.1.b Dynamic
- 6.1.c Sticky
- 6.1.d Max MAC addresses
- 6.1.e Violation actions
- 6.1.f Err-disable recovery

Describe common access layer threat mitigation techniques

- 6.2.a 802.1x
- 6.2.b DHCP snooping

6.2.c Nondefault native VLAN

Configure, verify, and troubleshoot IPv4 and IPv6 access list for traffic filtering

- 6.3.a Standard
- 6.3.b Extended
- 6.3.c Named

Verify ACLs using the APIC-EM Path Trace ACL Analysis tool

Configure, verify, and troubleshoot basic device hardening

- 6.5.a Local authentication
- 6.5.b Secure password
- 6.5.c Access to device
 - 6.5.c. (i) Source address
 - 6.5.c. (ii) Telnet/SSH
- 6.5.d Login banner

Describe device security using AAA with TACACS+ and RADIUS

Infrastructure Management

Configure and verify device-monitoring protocols

- 7.1.a SNMPv2
- 7.1.b SNMPv3
- 7.1.c Syslog

Troubleshoot network connectivity issues using ICMP echo-based IP SLA

Configure and verify device management

- 7.3.a Backup and restore device configuration
- 7.3.b Using Cisco Discovery Protocol or LLDP for device discovery
- 7.3.c Licensing
- 7.3.d Logging
- 7.3.e Timezone
- 7.3.f Loopback

Configure and verify initial device configuration

Perform device maintenance

- 7.5.a Cisco IOS upgrades and recovery (SCP, FTP, TFTP, and MDS verify)
- 7.5.b Password recovery and configuration register
- 7.5.c File system management

Use Cisco IOS tools to troubleshoot and resolve problems

- 7.6.a Ping and traceroute with extended option
- 7.6.b Terminal monitor
- 7.6.c Log events
- 7.6.d Local SPAN

Describe network programmability in enterprise network architecture

- 7.7.a Function of a controller
- 7.7.b Separation of control plane and data plane
- 7.7.c Northbound and southbound APIs

Benefits of CCNA Lab at UC Merced

- Wired network, will not affect any existing WIFI or Internet connections
- Raise STEM appearance at UCM
- HOMEGROWN ORG not a national org
 - BOBCAT Pride
- Installed by a UCM bobcat, not UCM administration
 - Accessibility is a MAJOR problem with UCM admin.
 - Makerspace (not available to UCM students) vs Q Project's 3d printers (everything operated by UCM students and accessible to everyone)
 - Makerspace (no education to everyone) vs Q Project (3d Printing workshop series along with Cyber workshop series)
- Practice Hands-on Skills that will be accessible to ALL UCM students to prepare for the CCNA Certification
- First CCNA Lab at UC Merced (Major Historical Event)
- Only about a grand to get started! (\$1,026.37)

Works Cited

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