Skills 39 Networking Technology Topics 1.0

為方便選手準備資訊與網路技術職類比賽，特整理發佈網路技術項目的技能規範，以供參考。

比賽的目的在於藉由考驗選手對網路架構元件的交互運作以及轉換需求為裝置設定。比賽過程不可參閱任何自備或外界資料－除非由命題單位提供的文件或資料。

下列主題為比賽技術規範技術主題的一般性指引，然而，其它相關的主題也可能出現在比賽中。另外為了因應國際賽技能規範以及業界技術的改變，本指引可能在沒有通知的狀況下隨時更動。

- 1.0 Network Principles
  - 1.1 Network theory
    - 1.1.a Describe basic IOS software architecture
      - 1.1.a (i) Control plane and Forwarding plane
    - 1.1.b Identify Cisco express forwarding concepts
      - 1.1.b (i) RIB, FIB, Adjacency table
    - 1.1.c Explain general network challenges
      - 1.1.c (i) Unicast flooding
      - 1.1.c (ii) Out of order packets
      - 1.1.c (iii) Asymmetric routing
    - 1.1.d Explain IP operations
      - 1.1.d (i) ICMP unreachable, redirect
      - 1.1.d (ii) IP fragmentation
      - 1.1.d (iii) TTL
      - 1.1.d (iv) IP MTU
    - 1.1.e Explain TCP operations
      - 1.1.e (i) Handshaking
      - 1.1.e (ii) MSS
      - 1.1.e (iii) Windowing
    - 1.1.f Explain UDP operations
  - 1.2 Network implementation and operation
    - 1.2.a Evaluate proposed changes to a network
      - 1.2.a (i) Changes to routing protocol parameters
      - 1.2.a (ii) Migrate parts of a network to IPv6
      - 1.2.a (iii) Add new switches to an existing network
  - 1.3 Network troubleshooting
    - 1.3.a Use IOS troubleshooting tools
      - 1.3.a (i) show, debug
      - 1.3.a (ii) ping, traceroute with extended options
    - 1.3.a Apply troubleshooting methodologies
      - 1.3.b (i) Diagnose the root cause of networking issue (analyze symptoms, identify and describe root cause)
      - 1.3.b (ii) Design and implement valid solutions according to constraints
      - 1.3.b (iii) Verify and monitor resolution
    - 1.3.c Interpret packet capture
      - 1.3.c (i) Using Wireshark trace analyzer

2.0 Layer 2 Technologies

2.1 LAN switching technologies

2.1.a Implement and troubleshoot switch administration

2.1.a (i) MAC address table

2.1.a (ii) errdisable

2.1.a (iii) L2 MTU

2.1.b Implement and troubleshoot layer 2 protocols

2.1.b (i) CDP, LLDP

2.1.c Implement and troubleshoot VLAN

2.1.c (i) Access ports

2.1.c (ii) VLAN database

2.1.c (iii) Normal, extended VLAN, voice VLAN

2.1.d Implement and troubleshoot trunking

2.1.d (i) VTP

2.1.d (ii) dot1Q

2.1.d (iii) Native VLAN

2.1.d (iv) Pruning

2.1.e Implement and troubleshoot EtherChannel

2.1.e (i) LACP, PAgP, manual

2.1.e (ii) Load-balancing

2.1.f Implement and troubleshoot spanning-tree

2.1.f (i) PVST+/RPVST+

2.1.f (ii) STP priority, cost, timers

2.1.f (iii) port fast, BPDUguard

2.1.g Implement and troubleshoot other LAN switching technologies

2.1.g (i) Local SPAN

2.2 Layer 2 WAN circuit technologies

2.2.a Implement and troubleshoot HDLC

2.2.b Implement and troubleshoot PPP

2.3.b (i) Authentication

2.3.b (ii) PPPoE Client

2.3.b (iii) MLPPP

3.0 Layer 3 Technologies

3.1 Addressing technologies

3.1.a Identify, implement and troubleshoot IPv4 addressing and subnetting

3.1.a (i) Address types, VLSM

3.1.a (ii) ARP

3.1.b Identify, implement and troubleshoot IPv6 addressing and subnetting

3.1.b (i) Address types

3.1.b (ii) EUI-64

3.1.b (iii) ND, RS/RA

3.1.b (iv) Autoconfig/SLAAC

3.2 Fundamental routing concepts

3.2.a Implement and troubleshoot static routing

3.2.b Implement and troubleshoot default routing

3.2.c Compare routing protocol types

3.2.c (i) Distance vector

3.2.c (ii) Link state

3.2.d Implement and troubleshoot passive interface

3.2.e Implement, optimize and troubleshoot routing protocol manual and auto summarization

3.2.f Implement and troubleshoot routing protocol authentication

3.3 RIP (v2 and v6)

3.3.a Implement and troubleshoot RIPv2

- 3.3.b Describe RIPv6 (RIPng)
- 3.4 EIGRP (for IPv4 and IPv6)
  - 3.4.a Describe packet types
  - 3.4.b Implement and troubleshoot neighbor relationship
  - 3.4.c Implement and troubleshoot loop free path selection
    - 3.4.c (i) RD, FD, FC, successor, feasible successor
    - 3.4.c (ii) Metric and weight
  - 3.4.d Implement and troubleshoot general operations
  - 3.4.e Implement and troubleshoot load-balancing
    - 3.4.e (i) equal-cost
    - 3.4.e (ii) unequal-cost
- 3.5 OSPF (v2 and v3)
  - 3.5.a Describe packet types
  - 3.5.b Implement and troubleshoot neighbor relationship
  - 3.5.c Implement and troubleshoot network types
    - 3.5.c (i) Point-to-point, broadcast
  - 3.5.d Implement and troubleshoot path preference
  - 3.5.e Implement and troubleshoot general operations
- 3.6 BGP
  - 3.6.a Configure and verify basic eBGP
    - 3.7.a (i) Peering
    - 3.7.a (ii) route advertisement and summarization

4.0 VPN Technologies

- 4.1 Tunneling
  - 4.1.a Implement and troubleshoot encapsulation
    - 4.1.a (i) GRE
  - 4.1.b Implement and troubleshoot IPv6 tunneling techniques
    - 4.1.b (i) Manual
    - 4.1.b (ii) Auto
  - 4.1.c Identify IPv6 tunneling transition mechanism
- 4.2 Encryption
  - 4.2.a Implement and troubleshoot IPsec with preshared key
    - 4.2.a (i) Transport mode and Tunnel mode
    - 4.2.a (ii) Route-based and Policy-based

5.0 Infrastructure Security

- 5.1 Device security
  - 5.1.a Implement and troubleshoot IOS AAA using local database
  - 5.1.b Implement and troubleshoot device access control
    - 5.1.b (i) Lines (VTY, AUX, console)
    - 5.1.b (ii) SNMP
    - 5.1.b (iii) Management plane protection
    - 5.1.b (iv) Password encryption
  - 5.1.c Describe device security using IOS AAA with TACACS+ and RADIUS
    - 5.1.d (i) AAA with TACACS+ and RADIUS
    - 5.1.d (ii) Local fallback
- 5.2 Network security
  - 5.2.a Implement and troubleshoot switch security features
    - 5.2.a (i) Storm control
    - 5.2.a (ii) First-Hop Security
    - 5.2.a (iii) port-security
  - 5.2.b Implement and troubleshoot router security features
    - 5.2.b (i) Types of IPv4 access control lists

- 5.2.b (ii) IPv6 traffic filter

6.0 Infrastructure Services
- 6.1 System management
  - 6.1.a Implement and troubleshoot device management
    - 6.1.a (i) Console and VTY
    - 6.1.a (ii) telnet, HTTP, HTTPS, SSH
    - 6.1.a (iii) (T)FTP
  - 6.1.b Implement and troubleshoot SNMP
    - 6.1.b (i) v2c, v3
  - 6.1.c Implement and troubleshoot logging
    - 6.1.c (i) Local logging, syslog
    - 6.1.c (ii) Timestamp
- 6.2 Network services
  - 6.3.b Implement and troubleshoot IPv4 and IPv6 network services
    - 6.3.c (i) HSRP
    - 6.3.c (ii) NTP
    - 6.3.c (iii) DHCP
    - 6.3.c (iv) NAT