Test 1: NET3011 – Advanced Switching

Winter 2012

Time: 50 minutes; Test scored out of: 45 Total Marks available: 48
(Allocation of marks is shown beside each question)

Instructions:

1. BEFORE answering any questions, please check that your copy of the test has all pages (as indicated in the footer at the bottom of each page). Please read all questions carefully, then answer question 0 first!

2. Be sure to **mark your name (both written and bubbled)** on the scantron answer sheet.

3. All multiple choice answers should be circled on this test paper **and** then marked on the scantron answer sheet.

4. All multiple choice questions are worth 1 mark, unless otherwise noted.

5. For multiple choice questions, if you do not find an answer which is clearly the correct choice, choose the *best* answer.

6. If you are uncertain what a question is asking, make reasonable assumptions, write those assumptions down on this test paper, and continue answering the question.

0. What is your:

NAME? _____ Student Id? _____

(Continued on next page)

1. Refer to the CLI output for ALS2 below. What implementation of spanning tree best describes the spanning-tree operational mode of the switch?

(a) IEEE 802.1D **correct**
(b) IEEE 802.1s
(c) IEEE 802.1w
(d) PVRST+
(e) none of above

```
ALS2# show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    32769
              Address     000a.b8a9.d680
              Cost        19
              Port        9 (FastEthernet0/7)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769  (priority 32768 sys-id-ext 1)
              Address     0019.068d.6980
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time 300

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/7            Root FWD 19        128.9    P2p
Fa0/8            Altn BLK 19        128.10   P2p
Fa0/9            Altn BLK 19        128.11   P2p
Fa0/10           Altn BLK 19        128.12   P2p
Fa0/11           Altn BLK 19        128.13   P2p
Fa0/12           Altn BLK 19        128.14   P2p
```

2. Which STP timer defines the length of time spent in the listening and learning states
(a) hello time
(b) forwarding age
(c) forwarding delay **correct**
(d) max age
(e) max delay

3. Which one of the following is the best bridge priority that you would configure from the CLI for a spanning-tree root switch?
(a) 0 **correct**
(b) 1
(c) 4096
(d) 8192
(e) 65536

4. Which of the following are characteristics of a properly designed campus network? Choose **all** that apply.
(a) Modular **correct**
(b) Flexible **correct**
(c) Scalable **correct**
(d) Highly available **correct**
(e) none of the above

5. Why are hierarchical designs used with layers as an approach to network design? Pick 2.
(a) Simplification of large-scale designs **correct**
(b) Reduce complexity of troubleshooting analysis **correct**
(c) Reduce costs by 50 percent compared to flat network designs
(d) Packets that move faster through layered networks reduce latency for applications

6. Which of the following are examples of peer-to-peer applications? Choose at least two.
   (a) Video conferencing **correct**
   (b) IP phone calls **correct**
   (c) Workstation-to-workstation file sharing **correct**
   (d) Web-based database application
   (e) Inventory management tool

7. When implementing multiple complex components, which of the following is the most efficient approach, according to Cisco's "best-practice approach to lifecycle design"?
   (a) Implement each component one after the other, test to verify at each step **correct**
   (b) Implement all components simultaneously for efficiency reasons
   (c) Implement all components on a per-physical location approach.
   (d) Let your lab partner do all the work

8. L2 control protocols (DTP, VTP, STP BPDUs, PAgP, LACP, CDP, etc) always run on:
   (a) the default VLAN **correct**
   (b) the native VLAN
   (c) the management VLAN
   (d) trunk links only
   (e) whatever VLAN you assign for them

9. When VTP pruning is enabled, it stops:
   (a) broadcast traffic across a trunk link if the far-end switch has no hosts in the VLAN **Yup**
   (b) DTP announcements across a trunk link if the far-end switch has no hosts in the VLAN
   (c) VTP announcements across a trunk link if the far-end switch has no hosts in the VLAN
   (d) all traffic/announcements across a trunk if the far-end switch has no hosts in the VLAN
   (e) knowledge of locally configured VLANs from being propagated to other switches

10. True or False? Switches in VTP Transparent mode will only forward VTP messages belonging to their configured (ie. non NULL) domain.
   (a) True **correct**
   (b) False

11. Which of the following is **not** a valid load balancing criterion?
   (a) dst-ip
   (b) dst-mac
   (c) src-dst-ip
   (d) src-dst-mac
   (e) all of the above are valid criteria **correct**

12. [3 marks] In Chapter 1 of the textbook, Cisco presents their "best-practice approach to lifecycle design". Give the name of each phase, in the correct order, and include a brief description (one line, but **clear**!) of each phase.

    Prepare: establish requirements, develop strategy, propose high-level architecture
    Plan: identify network requirements, characterize existing and needed infrastructure
    Design: take planning results and design detailed network specification
    Implement: take design specs and build or add requirement network infrastructure
    Operate: "the final test", maintain network health & high availability; do fault detection
    Optimize: pro-active management & possible redesign if too many operational faults

13. [2 marks] Give at least two **clear** reasons why 802.1Q is the preferred standard for VLAN trunking.

    – Open (IEEE) standard not proprietary
    – Better support for QoS
    – Less overhead (ISL adds 30 bytes; 802.1Q adds only 4 bytes)
    – ISL is deprecated and not supported on all Cisco equipment

14. [1 mark] **Clearly** explain the difference between a "local VLAN" design and an "end to end VLAN" design.

    As per textbook pp 54-55; and Ch 2 lecture slide deck
    – "local VLAN" has different VLANs everywhere; no consistency between buildings
    – "end-to-end" has consistent VLANs across all buildings/locations

15. [1 mark] Are DTP announcements sent over a link that is configured as "switchport mode trunk"? You must provide evidence to "prove" your answer in order to get marks!

    Yes. Lab work demonstrated successful trunk negotiation between "trunk" & "auto" modes

16. [1 mark] Are Etherchannel announcements sent over the link(s) configured as "channel-group {#} mode on"? Provide evidence to "prove" your answer.

    No: fail to form Etherchannel for either PAgP auto or LACP passive

17. [2 marks] The President of your company is demanding better internet access, especially since the company has a 10G fiber link to the internet. She uses two sources for time-sensitive information: slashdot.org and www.cbc.ca. Unfortunately, only 100Mbps links are available into her office. Your boss tells you to set up Etherchannel. What is the **best** choice for number of links to bundle together, to gain maximum performance with minimum cost? Justify your answer.

    BEST includes most cost-effective. Since only two sites, load balancing algorithm will only generate choices for at most two different links. No point in having any more than **two links**. Any more than that will result in unused, or greatly underused links.

18. [1 mark] **Clearly** identify a significant advantage that LACP has over PAgP.

    LACP provides ability for hot-standby links for maximum uptime on mission-critical connections.

19. [2 marks] For VTP, we say that normally a switch in Client mode can **not** modify the VLAN configuration or behavior. There are, however, two exceptions to this rule. **Clearly** identify the two circumstances when a Client switch **will** modify the configuration or behaviour. (Hint: one from lectures, one from labs [step 13 of Lab 2-1].)

    – If Client has higher configuration rev number, will overwrite a switch in Server mode
    – Clients may shutdown a VLAN (locally) using "**`SW(config)# shutdown vlan xx`**"

20. Your colleague claims that any switch supporting 802.1q trunking must have the capacity to handle 4096 VLANs concurrently.
    A. [1 mark] From what do you suppose this claim is derived?

    802.1Q tags have a 12 bit field, allowing for 4096 numerical values.

    B. [2 marks] Discuss the accuracy of this statement.

    – Stated value should be 4094 (VLANs 0, 4095 are both “reserved”)
    – VTP versions 1,2 only implemented support for only VLAN 1-1004;
    – VTP ver 3 implementation provides support for the whole usable VLAN range, BUT switch must be in Transparent mode.

    – Will also accept: the 29xx series have a limit of 255, showing that 4094 not required

    Unfortunately only Cisco switches running CatOS (eg. 6500) are capable of running the IEEE standardized MVRP, which gets you out of this compatibility mess.

21. [2 marks] A colleague calls you for advice while troubleshooting at a client site. He is concerned that he can't see the VTP information in the running configuration of a switch. What do you tell him? (Give a **clear** explanation as well as any specific commands required.)

– VTP information is stored in NVRAM or flash
– "show VTP status" will show VTP info
– would also accept "show vlan" (eg. learned dynamically via VTP)

22. [3 marks] Identify the conditions required for a VTP Client device to successfully adopt the VLAN information from an adjacent VTP Server device (n.b. authentication is NOT in use).

– Client must domain name must be NULL or identical to advertised domain
– Client must be running the same VTP version
– Client must be connected via a trunk link
– Would also accept "must have lower rev #" (or else will overwrite instead of learning)

23. [4 marks] What must be taken into consideration with respect to VTP, when Private VLANs are implemented?
– Transparent mode
– Implemented individually on all participating switches
– All Intervening switches have the same Domain name as the pVLAN switches
– All intervening switches define the same VLANs as the pVLAN

24. [5 marks] **Clearly** define and distinguish the terms: *default VLAN*, *Native VLAN*, *Management VLAN*, *User VLAN*, and *Blackhole VLAN*. Be sure to include relevant L2 control protocols and any specific VLAN numbers in your definitions.

Definitions for Cisco boxes as per slide deck on VLAN types:
– default VLAN: always VLAN 1; by "default" all other VLANs start off in VLAN 1
DTP, VTP, STP BPDUs, PAgP, LACP, CDP run on this VLAN
– Native VLAN: the (one) single VLAN that runs across a trunk untagged; configurable; choice of specific VLAN number is according to local/company policy
– Management VLAN: the VLAN you do **not** share with ordinary users! For telnet & SSH access to configure & manage network equipment; locally chosen
– User VLAN: any VLAN (possibly several) used for "ordinary" user data; locally chosen
– Blackhole VLAN: defined purely for security purposes; never allowed across trunk links
choice of specific VLAN is according to local/company policy;
new equipment is given a "blank" config with all ports in this VLAN
and then ports actually in use are re-configured to some other VLAN

25. Consider the following configuration commands:

```
Sw(config)# vlan 201
Sw(config-vlan)# private-vlan isolated
Sw(config-vlan)# vlan 202
Sw(config-vlan)# private-vlan community
Sw(config-vlan)# vlan 203
Sw(config-vlan)# private-vlan community
Sw(config-vlan)# vlan 200
Sw(config-vlan)# private-vlan primary
Sw(config-vlan)# private-vlan association 201,202,203
Sw(config-vlan)# interface fastethernet 0/23
Sw(config-if)# switchport mode private-vlan promiscuous
Sw(config-if)# switchport private-vlan mapping 200 201,202
Sw(config-if)# interface fastethernet 0/24
Sw(config-if)# switchport mode private-vlan promiscuous
Sw(config-if)# switchport private-vlan mapping 200 202,203
Sw(config-if)# interface range fastethernet 0/1 - 2
Sw(config-if)# switchport mode private-vlan host
Sw(config-if)# switchport private-vlan host-association 200 201
Sw(config-if)# interface range fastethernet 0/3 - 4
Sw(config-if)# switchport mode private-vlan host
Sw(config-if)# switchport private-vlan host-association 200 202
Sw(config-if)# interface range fastethernet 0/5 - 6
Sw(config-if)# switchport mode private-vlan host
Sw(config-if)# switchport private-vlan host-association 200 203
```

a. [5 marks] Assume hosts **A**, **B**, ... **F** are connected to ports f0/**1**, f0/**2**, ... f0/**6**, consecutively and hosts **X** & **Y** are connected to f0/**23** & f0/**24**, all of which are "up / up". **Important**: marks will be deducted for incorrect answers so **NO** guessing!

a.1. A ping originating from host X could successfully reach which host(s)?

A, B, C, D, Y

a.2. A ping originating from host Y could successfully reach which host(s)?

C, D, E, F, X

a.3. A ping originating from host A could successfully reach which host(s)?

X

a.4. A ping originating from host C could successfully reach which host(s)?

D, X, Y

a.5. A ping originating from host E could successfully reach which host(s)?

F, Y

b. [2 marks] Imagine a scenario (eg. Lab 2-9) where two pVLANs configured as above are joined by a trunk. A host in the isolated pVLAN on the right side pings a Host X on the left side pVLAN. Assume the ping is successful. **Clearly** identify the 802.1Q tags that appear on the ping request and response as they travel across the trunk.

– Isolated host is in pVLAN 201 so ping **request** gets tagged as VLAN **201**
– Host X is on port fa0/23 in pVLAN 200 so ping **response** tagged as VLAN **200**

Additional work, notes, or rough work