

Network Administration and System Administration, Spring 2015

Midterm Examination (Handwritten Part) Solution

30 points

Time: 6:30pm - 9:30pm, Monday, April 20, 2015

Name: NASA TA

- Remember to put your name, student ID, and page number on both pages of the exam paper.
- You are free to use the Internet and your laptops when taking this exam, but NOT allowed to communicate with others (online or in person).

Problem 1. True or False problems. You only need to specify T or F for each problem. (15 points)

1. (T) A computer does not need special driver for a network interface card to receive untagged VLAN packets.
2. (T) Always deploy the best class of network cable when constructing a building network.
3. (F) For better reliability and robustness, it is better to put IDF in different floors at different vertical locations in a building.

機櫃一般放在不同層的同一個位置, 以方便維護, 維修 (能快速找到機櫃) 與佈線 (機櫃間彼此距離短).

4. (Give Away) The lowest class of UTP cable to support Gigabit Ethernet is Cat.5.

規格上來說至 cat 5e 才全面支援 Gigabit, 但優質的 Cat 5. 網路線在短距離亦可以達到 Gigabit, 因此本題送分.

5. (F) Link aggregation can be used to increase the bandwidth, but cannot improve the reliability of the link.

若一條線斷線, 其餘的線路仍可提供通訊服務, 線路兩端並不會因此失連, 因此可增進兩端連線的可靠性.

6. (F) A broadcast Ethernet frame has a destination address of 00-00-00-ff-ff-ff.

廣播 MAC 應為 ff-ff-ff-ff-ff-ff.

7. (F) A hard drive labeled with 2 TB capacity can store 2^{31} bytes of data.

$2 \text{ TB} = 2 \times 10^3$, $2 \text{ TiB} = 2^{31}$.

8. (F) If a hard drive is frequently used by a bittorrent application, it has a higher probability to fail in the long term.

硬碟的使用頻率與溫度和硬碟的壽命並無明顯關係.

9. (T) The sequential read speed of the fastest SSD on the market today can already saturate both SATA II's and USB 3.0's bandwidth.

SATA SSD 約維持在 550MBps 的速度, 低於 USB3.0 之傳輸速度, 但 PCI-Express SSD 則可達到 3.2GBps 之速度, 高於 SATA II 與 USB 3.0

10. (F) When a hard drive fails, its data can no longer be retrieved, regardless of the money you can spend.

傳統硬碟損毀可能是由於磁頭老化, 控制器毀損或磁區受損, 前兩者可藉由替換相應元件解決, 磁區受損則受損部份資料無法救援, 但其他則可

11. (T) When a SSD fails, its data can no longer be retrieved, regardless of the money you can spend.

SSD 正常使用中會有少量記憶體單元錯誤, 此部份非關物理受損, 在這些未標記的損毀單元低於全部的 5% 時, 控制器仍能藉由演算法還原出正確資料, 然此部份未標記之記憶體錯誤高於 5%, 則控制器將無法分辨正確資料, 導致讀寫失敗, 此時資料是無法救援的. 因此 SSD 須定期手動做 secure erase, 標記損毀單元並將這些單元棄之不用. (secure erase 須將 SSD 資料洗掉, 因此無法自動週期執行)

12. (T) In a RAID 5 system, more than 1 drive failure would result in total data loss.

More than 2 drive failure would result in data loss. 1 drive failure only result in few data bits error.

13. (F) 168.95.1.1 is in a class C network.

Class B.

14. (T) 10.4.217.0 is a private IP address.

15. (Given Away) When the size of an IP packet is larger than the MTU at the link layer, the packet will simply be discarded.

本題題意不清, 有兩種解釋: 1. 對傳送端而言, 若欲傳送之 IP packet 大於 MTU, 則其會將 packet 依 MTU 大小切割後傳出. 2. 對接收端而言, 若接收到之 packet 大於 MTU, 則其會直接丟棄. 因此本題送分.

Problem 2. What is the manufacturer of the device with Ethernet address 78:2b:cb:78:97:ab ? (1 point)

DELL

Problem 3. In a 172.30.0.0/255.254.0.0 network, (1) what is the maximum number of hosts that can be put in this network, given that each one needs to have a unique IP address? (1 point) (2) Write down the network address and the broadcast address of this network. (2 points)

1. $(256 - 254) \times (256 - 0) \times (256 - 0) - 2 = 131070$.

2. Network address: 172.30.0.0

3. Broadcast address: 172.31.255.255

Problem 4. Use a sentence to describe the main task of physical layer in the 5-layer Internet protocol stack. (2 points)

傳送端將 bit stream 轉成類比訊號透過媒介傳出, 接收端由媒介接收類比訊號並轉回數位 bit stream

Grading Criteria: 敘述正確 1 分, 寫到轉成類比, 透過媒介 (media) 各 0.5 分

Problem 5. Please write down the theoretical speed of the following interfaces and order them from the fastest to the slowest: (A) USB 3.0 (B) USB 2.0 (C) USB 1.0 (D) Thunderbolt 2.0 (E) SATA 1 (F) SATA 2 (G) SATA 3 (H) FireWire (IEEE 1394) 400 (5 points)

1. (D) Thunderbolt 2.0 - 20Gbps / 2.5GBps
2. (G) SATA 3 - 6Gbps / 600MBps
3. (A) USB 3.0 - 5Gbps / 500MBps
4. (F) SATA 2 - 3Gbps / 300MBps
5. (E) SATA 1 - 1.5Gbps / 150MBps
6. (B) USB 2.0 - 480Mbps / 60MBps
7. (H) FireWire (IEEE 1394) 400 - 400Mbps / 50MBps
8. (C) USB 1.0 - 1.5Mbps / 187.5KBps

Grading Criteria: SATA 與 USB3.0 等高速傳輸界面中, 為防止高速傳輸中之位元錯誤, 加入驗證位元, 資料比為 8/10, 因此以 SATA 3 6Gbps 頻寬而言, 理論最高速為 $6\text{Gbps}/8*8/10 = 600\text{MBps}$. 本次期中考中無論是否計算此一比例均給分 (舉例而言 SATA 3 速度 6Gbps, 4.8Gbps, 750MBps, 600MBps 均給對)

Problem 6. Explain (1) what is a journaling filesystem (2) what is its main benefit. (4 points)

A journaling file system is a file system that keeps track of the changes that will be made in a journal (which is usually a circular log in a dedicated area of the file system) before committing them to the main file system. In the event of a system crash or power failure, such file systems are quicker to bring back online and less likely to become corrupted - from wikipedia.