NWEN 243 : Assignment 4

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1. *Briefly describe what DHCP and NAT are used for.*

   DHCP, the Dynamic Host Configuration Protocol, is uses on a network to dynamically assign IP address (plus other network configs) to a device on the network.
   NAT is a method of mapping one IP address (of a local networks router) to a range of addresses within the network.

2. *Briefly describe how Dijkstra's algorithm works.*

   It's an algorithm to find the shortest path between a and b. It picks the unvisited node with the low distance, calculates the distance through it to each unvisited neighbor, and updates the neighbor's distance if smaller.

3. *Briefly describe how Distance Vector algorithm works.*

   A router transmits its distance vector to each of its neighbors.
   Each router saves the most recently received distance vector from each of its neighbors.
   A router recalculates its distance vector when:
   It receives a distance vector from a neighbor containing new info.
   It discovers that a link to a neighbor has gone down.
   The DV equation is based on minimizing the cost to each destination

4. *Name two examples of IGP.*

   - RIP: Routing Information Protocol
   - OSPF: Open Shortest Path First

5. *In relation to AS, briefly compare what IGP and BGP are used for.*

   IGP is the protocol use to route traffic within an autonomous systems.
   Where is BGP is the protocol for routing traffic between different autonomous systems.

6. *In BGP, explain what eBGP and iBGP do.*

   - eBGP: obtain subnet reachability information from neighboring ASs.
   - iBGP: propagate reachability information to all AS-internal routers.

7. *In BGP, explain how the shortest path is determined and how to identify the border gateway router (the router connecting to the next-hop AS).*

   The shortest path is found with OSPF, utilizing Dijkstra's and the Distance Vector algorithm. The border gateway router of an AS is that/those through which packets leave the AS to other AS's etc..

8. *In BGP, if there is a tie between two paths with the same cost / distance, explain how the path will be selected.*

   It will choose the path with the closest NEXT-HOP.

9. *Each network interface card has a permanent address. What is this address called? In terms of routing what is this address used for?*

   This permanent address is the MAC address. This is used in frame headers to identify source and destination.

10. *Based on parity check, explain how a single bit error can be detected and corrected.*

    Based on either a checksum or 1-2 stored parity bits the value of an aligned data bit can be determined to be integral of not, ie corrupted.

11. *In addition to parity check, why was CRC proposed? Briefly explain how CRC works.*

    CRC is a more powerful and robust error-detection coding:
    Calculates a short, binary sequence, a CRC, for each block of data to be sent or stored and appends it to the data, forming a codeword.

    When a codeword is received or read, the device either compares its check value with one freshly calculated from the data block, or equivalently, performs a CRC on the whole codeword and compares the resulting check value with an expected residue constant.

    If the CRC values do not match, then the block contains a data error

12. *Name two of the fundamental MAC protocols covered in the lecture, which use channel partitioning or random access, and briefly explain how they work.*

    TDMA, time division multiple access is a channel partitioning MAC protocol.
    Channel is accessed in rounds, and each station gets fixed time length per round. FDMA, frequency division multiple access is also a channel partitioning protocol.
    Channel is divided into frequency bands, where each station has a set bandwidth allocation for access.

13. *Explain how ARP works and how the forwarding table in a switch (not a router) is created.*

    Address Resolution Protocol is a procedure for mapping a IP address to a MAC address.