1. What are the differences between routers, bridges and repeaters? Discuss from the viewpoint of  
   their tasks, features and positions in the layering model.

* Router: Mainly operates in the network layer, used to route packets by their IP addresses
* Bridge: Operates in the data link layer, have the same functionality as repeater, used to divide a large network into smaller segment to avoid collision and filter frames by MAC address of sender and receiver
* Repeater: Operates in the physical layer, used to extends the length of a network by regenerate signal over the same network before the signal becomes too weak or corrupted

1. Illustrate the operation of a bridge. Give an example using a small network, and show the  
   contents of the forwarding table and its change.
2. Illustrate the operation of a router. Show each step from receiving a frame to sending a frame.

* To send out a packet, the host attach its IP address into the header and send the packet to the connected router.
* When receiving a packet, the router determine the next destination by performing bitwise AND operator of the destination IP address and all subnet address stored in its routing table. If there is a match, the router send the packet to the matched subnet, else it will send to the default entry

1. Illustrate the operations of routers which forward an IP packet hop-by-hop, especially focusing  
   on the data link and network layer addresses.
2. -
3. What is the default route of the IP protocol? What does this technology realize?

* The default route of the IP protocol is the destination to send the packets when there is no match in the routing table.
* Default route address: 0.0.0.0/0, specify all networks

1. By looking at the Figure 1: Sample Network, answer the following questions:  
   (a) Show areas which share the same network address, and assign an address for each area.  
   (b) Show the broadcast domains and contention domains in the figure.  
   (c) Make a routing table for each router. Suppose that a port number is assigned from 1 to naccording as the number in the address variable of the port increases (e.g., MAC1 < MAC2).  
   (d) Suppose that host A runs a dynamic routing managing process, show a routing table for this  
   host.  
   (e) Is it possible to make this network topology without routers? If there is any problem, show  
   a solution for each problem. Explain the difference between network system with routers  
   and without routers

Diagram

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