Curso	: Arquitectura de Redes de Telecomunicaciones
Grupo	: 01
Profesor	: Ing. Javier Rivas León
Código	: CE 0706
Duración de la Prueba	: 120 minutos

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Entrega de exámenes: jueves 6 de diciembre. 09:30. G414.

EXAMEN FINAL

Semestre 2012 – II

1. **Enumere y realice una descripción de las partes que componen el hardware de un router. (4 puntos)**

2. **Defina que es el switch y describa detalladamente sus tres clasificaciones. (4 puntos)**

3. Dadas las siguientes direcciones IP. Diga la clase de dirección y Determine el valor de la dirección de red y de la máscara de subred de cada una de ellas: (2 puntos)

   a) 20.150.18.9/30
   b) 90.40.10.105/24
   c) 170.16.120.123/18
   d) 126.223.18.220/20

4. Una empresa minera que tiene operaciones en Lima, La Libertad, Cajamarca y Moyobamba desea implementar una red de datos LAN y WAN, con la finalidad de interconectar sus bases de operaciones con la sede central de Lima, la cual está estructurada de la siguiente manera:
   Cede Lima: Es la sede principal, y se encuentra interconectada con las bases Cajamarca y la Libertad. Cuenta con tres subredes: Administración, Operaciones y una SAN (servidores) a partir de la dirección 190.15.0.0/16.
   Cede La Libertad: Esta base se encuentra interconectada con Lima y Cajamarca y cuenta con dos subredes a partir de la dirección 200.15.12.0/24.
   Cede Cajamarca: Esta base se interconecta con Lima, La Libertad y Moyobamba, además de contar con una red local con dirección 200.15.10.0/24.
   Cede Moyobamba: Esta base se interconecta con Cajamarca y cuenta con una red local con dirección 198.0.0.0/24

   La dirección WAN utilizada es 120.14.0.0/30

   a) Diseñar la estructura de la red de datos (2 puntos)
   b) Aplicando la técnica VLSM determine las direcciones IP para la WAN (2 puntos)
   c) Muestre la distribución de direcciones IP a nivel LAN y WAN (1 punto)

d) Desarrolle la tabla de enrutamiento de la red de datos (2 puntos)

5. Lea atentamente el siguiente texto y conteste las siguientes preguntas
   a) Como se realiza la validación de la cabecera IP . (1 punto)
   b) Haga un resumen del texto de 20 líneas (2 puntos)

IP Forwarding

The processing of an IP datagram at a host or a router is almost identical, with the exception that IP forwarding is enabled on routers, but disabled on hosts. Having IP forwarding disabled means that a host only transmits an IP datagram if the payload of this datagram is locally generated. A host never transmits an IP datagram that it received from the network. The steps of processing a datagram in the IP module of a router or a host are illustrated in Figure 3.4. When an IP datagram is transmitted, the IP module performs a routing table lookup to determine the next hop, and sends the IP datagram to the next hop.

When an IP datagram is received, the IP module tests if the local system is the destination of the local system. If so, the IP datagram is demultiplexed and passed to a higher layer protocol, for example, UDP or TCP. If the local system is not the destination of the IP datagram, then there is a check whether IP forwarding is enabled on this system. If IP forwarding is enabled, that is, the system is a router, there will be a routing table lookup and an attempt to forward the datagram to a next hop router or the destination host. If IP forwarding is not enabled, that is, the system is a host, the datagram is discarded. Thus, the small, but crucial, difference between a router and a host is that a router forwards an incoming datagrams if it is not the destination, whereas a host drops a datagram in such a situation.

IP forwarding is a time critical process. Routers in a backbone network must be able to forward many million packets per second. Because of this, the implementation of IP forwarding at a router is highly optimized. We next take a more detailed look at the IP forwarding operations at a router and discuss performance related issues.1 The operations are discussed in the order in which they are executed.

IP Header Validation.

When a router receives a datagram, it first validates the header length, the version number, and the header checksum in the IP header. The version number must be 4. The header length field must satisfy the minimum length of 20 bytes, and the total length must be large enough to hold the IP header. In the header checksum validation, which was described in Chapter 2, the router calculates the sum of 16-bit sections of the IP header, and compares the result to the header checksum field. The entire IP header validation is a quick process.

Processing of Options :

If the IP header contains options, the router attempts to process the options before the routing table lookup. However, some IP header options require additional processing after the routing decision has been made. IP header options can involve numerous memory lookups, and may require the router to append or replace information in the option fields. Overall, processing IP header options can be time-consuming. To avoid that processing IP options becomes a bottleneck, routers often handle datagrams that contains header options separately from datagrams without options.

Parsing the Destination IP Address and Routing Table Lookup.

Next, the router parses the destination IP address and determines if it is the destination of the datagram. If so, the router checks if the datagram has been fragmented and, if necessary, performs a reassembly of the fragments. Since routers rarely are destinations of datagrams, the performance implications of this case are negligible. When the local router is not the destination , it performs a routing table lookup to determine the next hop. If no matching routing entry is found, the datagram is discarded and an ICMP error message is sent to the source IP address of the datagram.