Computer networks 503442-3

Assignments

Chapter:4 Network layer

Q1- Choose the correct answer.

1) network provides network-layer *connectionless* service
   (*datagram*, *virtual-circuit*)
2) network provides network-layer *connection* service
   (*datagram*, *virtual-circuit*)
3) In ..... simple inside network, complexity at "edge"
   (*datagram*, *virtual-circuit*)
4) In ..... complexity inside network
   (*datagram*, *virtual-circuit*)
5) …… Provides strict timing, reliability requirements need for guaranteed service
   (*datagram*, *virtual-circuit*)
6) is the high order bits of IP address
   (subnet part , host part)
7) is the low order bits of IP address
   (subnet part , host part)
8) In RIP, advertisements sent in ..... packets, periodically repeated
   (TCP, UDP)

Q2- Complete the following sentences.

1) Forwarding: move packets from router's input to appropriate router output

2) Routing: determine route taken by packets from source to destination.

3) Time to live field in IP Datagram header represent max number remaining hops (decremented at each router)

4) The minimum length of IP Datagram header 20 bytes

5) IP address 32-bit identifier for host, router interface

6) Interface connection between host/router and physical link

7) In motivation local network uses just one IP address as far as outside world is concerned

8) ICMP internet control message protocol used by hosts & routers to communicate network-level information

9) IPv6 datagram format fixed length 40 byte header

10) priority field in IPv6 datagram identify priority among datagrams in flow

11) flow label field in IPv6 datagram identify datagrams in same "flow."

12) The length of IP address in IPv6 is 128 bits

13) In tunneling IPv6 datagram carried as payload in IPv4 datagram among IPv4 routers

14) In distance vector algorithm, distance metric represents **number of hops**

15) In RIP, routing updates (DVs) are exchanged between neighbors approximately every 30 seconds in response message

16) In RIP, if no advertisement heard after 180 seconds, neighbor/link declared dead

Q3: Answer the following Questions

a) what's a subnet?

device interfaces with same subnet part of IP address

can physically reach each other *without intervening router*

detach each interface from its host or router, creating islands of isolated networks

each isolated network is called a *subnet*

b) What is the main security feature of NAT?

NAT only translates IP addresses and ports of its internal hosts, hiding the true endpoint of an internal host on a private network.

c) Briefly describe NAT router operation with *outgoing datagrams and incoming datagrams.*

outgoing datagrams*: replace (source IP address, port number) of every outgoing datagram to (NAT IP address, new port number) remote clients/servers will respond using (NAT IP address, new port number) as destination address*

incoming datagrams*: replace (NAT IP address, new port number) in destination fields of every incoming datagram with corresponding (source IP address, port #) stored in NAT table*

d) What are the motivations of *IPv6?*

initial motivation: 32-bit address space soon to be completely allocated.

additional motivation:
header format helps speed processing/forwarding
header changes to facilitate QoS

e) Suppose that A datagram of 3,500 bytes arrives at a router and must be forwarded to a link with an MTU of 1,300 bytes. Assume IP header of 20 bytes. Fragment the datagram, and specify the flag, and offset fields of all fragments.

Length = 1300	ID = x	Frag Flag =1	Offset = 0
Length = 1300	ID = x	Frag Flag =1	Offset = 160
Length = 940	ID = x	Frag Flag =0	Offset = 320

Q4: Answer the following Questions

a) What are the main differences between "link state" algorithms and "distance vector" algorithms?

message complexity

- ***LS:*** with n nodes, E links, O(nE) msgs sent
- ***DV:*** exchange between neighbors only
  - convergence time varies

---

speed of convergence

- ***LS:*** $O(n^2)$ algorithm requires O(nE) msgs
  - may have oscillations
- ***DV:*** convergence time varies
  - may be routing loops
  - count-to-infinity problem

---

robustness: what happens if router malfunctions?

LS:

- node can advertise incorrect *link* cost
- each node computes only its *own* table

DV:

- DV node can advertise incorrect *path* cost
- each node's table used by others
  - error propagate thru network

---

b) What is meant by link cost from node x to y; = ∞
not direct neighbors

c) What are the procedures taken when local link cost change in "distance vector" algorithms?

- node detects local link cost change

- updates routing info, recalculates distance vector

- if DV changes, notify neighbors

d) Give a brief Comparison of LS and DV algorithms in terms of

- message complexity
- speed of convergence
- robustness

message complexity

❖ ***LS:*** with n nodes, E links, O(nE) msgs sent

❖ ***DV:*** exchange between neighbors only

- convergence time varies

---

speed of convergence

❖ ***LS:*** $O(n^2)$ algorithm requires O(nE) msgs

- may have oscillations

❖ ***DV:*** convergence time varies

- may be routing loops
- count-to-infinity problem

---

robustness: what happens if router malfunctions?

LS:

- node can advertise incorrect *link* cost
- each node computes only its *own* table

DV:

- DV node can advertise incorrect *path* cost
- each node's table used by others
  - error propagate thru network

---

e) What are the main differences between intra- AS and inter-AS routing algorithm?

intra-AS sets entries for internal destination

inter-AS with **intra-AS** sets entries for external destination

(job of inter-AS is routing)

f) States the advanced features of OSPF (not in RIP)

- *security:* all OSPF messages authenticated (to prevent malicious intrusion)
- multiple same-cost paths allowed (only one path in RIP)
- for each link, multiple cost metrics for different TOS (e.g., satellite link cost set "low" for best effort ToS; high for real time ToS)
- integrated uni- and multicast support:
  - Multicast OSPF (MOSPF) uses same topology data base as OSPF
- hierarchical OSPF in large domains.

Best Regards

Assoc.Prof. Mohammed Abd-Elnaby