Internet Protocols: Quiz 3

- This quiz consists of true/false questions for 20 pts and three short answers problems for 30 pts, a total of 50 points.
- In the True/False questions, the following grading policy will be used:
  - **Correct answer + Correct explanation: +2 pts**
  - **Wrong answer, but right explanation: +1 pt**
  - **Wrong explanation or Blank/Unattempted answer: 0 pts**
- There will be ***no negative grading for the short answer or quantitative problems***. Partial credit may be awarded where appropriate.
- Open book policy
- ***Time: 45 min.*** **Strictly enforced.**
- This is the third quiz out of three quizzes. ***Best two out of three*** will be considered for final grades. Each of the two quizzes chosen will be weighted equally.

True or False? ***(20 points)***

T F

❑ ❑ MIBs can be defined using all the available features of ASN.1 syntax

❑ ❑ BOOTP is better than RARP for configuration because it runs directly over IP.

❑ ❑ In IP multicast, the sender needs only to be aware of the group address; the network takes care of distributing the packet efficiently to currently active receivers.

❑ ❑ IPv6 addressing is more powerful than IPv4 addressing for routing purposes because it allows address aggregation based on geography.

❑ ❑ When a packet is authenticated, an intermediate router can read, but cannot change any fields covered by the authentication checksum in a valid manner.

T F

❑ ❑ The IETF's approach to supporting real-time services is to keep the best-effort service model, and provide alternative transport protocols (eg RTP)

❑ ❑ The broadcast-and-prune approach to multicast routing is highly scalable

❑ ❑ The key components of IPv6 which allow plug-and-play are aggregatable global addresses and DHCP.

❑ ❑ RMON is an extension of the SNMPv1 protocol

❑ ❑ DHCP leases IP addresses as well as names

- 1) (10 pts) Explain briefly the functioning of the DHCP protocol (esp how clients obtain and renew leased addresses)

- 2) (10 pts) Classify the multicast routing protocols (RPM, DVMRP, MOSPF, PIM-SM, PIM-DM, CBT) under the following headings:

- Source-based trees:
- Shared trees:
- Data-driven tree building:
- Broadcast-and-prune:
- A priori tree building:
- Explicit Join:
- Implicit Join:
- Dense mode:
- Sparse mode:

- 3) (10 pts) Summarize the key addressing, routing and autoconfiguration features in IPv6

True or False? ***(20 points)***

T F

❑ √ MIBs can be defined using all the available features of ASN.1 syntax

No, MIBs use only a small subset of ASN.1 syntax.

❑ √ BOOTP is better than RARP for configuration because it runs directly over IP.

No, BOOTP is better because it runs over UDP (removes machine dependence), allows relays, and can send most of the configuration info in a single response.

√ ❑ In IP multicast, the sender needs only to be aware of the group address; the network takes care of distributing the packet efficiently to currently active receivers.

Yes, because this approach reduces the configuration overhead seen in the other approaches (replicated unicast) while maintaining efficiency (unlike broadcast)

❑ √ IPv6 addressing is more powerful than IPv4 addressing for routing purposes because it allows address aggregation based on geography.

No. Because it provides provider-based address aggregation which is in most cases directly related to the topology of the internetwork

√ ❑ When a packet is authenticated, an intermediate router can read, but cannot change any fields covered by the authentication checksum in a valid manner.

Yes, because the intermediate router cannot recompute the authentication checksum

T F

❑ √ The IETF's approach to supporting real-time services is to keep the best-effort service model, and provide alternative transport protocols (eg RTP)

No, this is only partly correct. The IETF is also working on enhancing the service model by defining "integrated services/RSVP" and "differentiated services"

❑ √ The broadcast-and-prune approach to multicast routing is highly scalable

No, because firstly it builds source-based trees, and secondly because it requires prune state to be kept on off-tree routers

❑ √ The key components of IPv6 which allow plug-and-play are aggregatable global addresses and DHCP.

No, the key components are link-local addresses, universal multicast support, DHCPv6, and neighbor discovery procedures of ICMPv6

❑ √ RMON is an extension of the SNMPv1 protocol

No, RMON is an extension of the MIB (MIB-II).

❑ √ DHCP leases IP addresses as well as names

No, DHCP leases only addresses (DHCP does not deal with names - host needs to contact DNS for names)

- 1) (10 pts) Explain briefly the functioning of the DHCP protocol (esp how clients obtain and renew leased addresses)

- Refer to the DHCP state diagram.
- When the host boots, it broadcasts a DHCP Discover message.
- In response it may get multiple DHCP Offers from DHCP servers.
- It chooses one of the offers and sends a DHCP Request message.
- The server responds with a DHCP Ack. The host now has an leased address.
- After 50% of the lease time, the source attempts to renew the lease by sending a 50% DHCP request.
- If the server sends an ACK, the lease has been renewed. If the server sends a NACK, the lease cannot be renewed. Else if the server does not respond, the host attempts to renew the lease after 87.5% of the lease by sending a 87.5% DHCP request.
- If the server NACKs or does not respond, then the lease expires, else if it receives an ACK, the lease has been renewed.

- 2) (10 pts) Classify the multicast routing protocols (RPM, DVMRP, MOSPF, PIM-SM, PIM-DM, CBT) under the following headings:

- Source-based trees: RPM, DVMRP, PIM-SM (optional), PIM-DM, MOSPF
- Shared trees: PIM-SM (optional), CBT
- Data-driven tree building: RPM, DVMRP, MOSPF, PIM-DM
- Broadcast-and-prune: RPM, DVMRP, PIM-DM
- A priori tree building: PIM-SM, CBT
- Explicit Join: PIM-SM, CBT
- Implicit Join: RPM, DVMRP, PIM-DM
- Dense mode: RPM, DVMRP, PIM-DM, MOSPF
- Sparse mode: PIM-SM, CBT

- 3) (10 pts) Summarize the key addressing, routing and autoconfiguration features in IPv6

- Addressing/routing:
  - Much larger addresses => will not run out of addresses for a long time.
  - provider-based (aggregatable global unicast addresses) allows many levels of hierarchy, and which allow aggregation that maps onto topology.
  - Multicast addressing and support is standard. Scope is part of the multicast address.
  - Geographic addressing also possible
  - Emulation of IPv4 addressing available.
- Autoconfiguration:
  - Stateless autoconfiguration using link-local addresses
  - Stateful autoconfiguration using DHCPv6 (made efficient given guaranteed support for multicast)
  - Neighbor discovery procedures which include ARP, router discovery etc