Mobile Computing Midterm (101/11)

1. What are three advantages of SIP? (6%) Describe functions of SIP INVITE, REGISTER, REFER, OPTION, INFO, UPDATE methods. (12%) What are the usages of SIP Contact, Record-Route, Via, Allow, Branch headers? (10%)

2. (a) What is the offer/answer mode for SDP? (2%)
   (b) Explain the meaning of
   "m=audio 45678 RTP/AVP 15 3 0
   a=rtpmap 2 G726-32/8000
   a=rtpmap 4 G723/8000
   a=rtpmap 15 G728/8000" for media information in SDP. (6%)
   (c) Explain the meaning of
   "m=audio 45678 RTP/AVP 2
   a=rtpmap 2 G726-32/8000
   m=audio 45679 RTP/AVP 4
   a=rtpmap 4 G723/8000
   m=audio 45680 RTP/AVP 15
   a=rtpmap 15 G728/8000" (2%)
   (d) Explain the meaning of "o=Collins 123456 001 IN IP4 station1.work.com" in SDP. (6%)

3. Describe and draw the SIP message flow with important headers to start a session via the proxy server. (18%)

4. (a) What are two major types of Ad Hoc routing protocols, depending on when they perform routing? List how these two types work. (6% each, 12% total) (b) Please classify DSR, DSDV, CGSR, AODV, TORA, ABR, SSA into which type they belong (7%) (19%).

5. (a) How CGSR does its three data forwarding steps? (6%) (b) List three control messages of AODV. When are they sent in AODV (9%) (c) What is the major difference of AODV and DSR? (4%) (d) How ZRP works in ad hoc network? (6%) (25% total)

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Ans:

(a) A powerful alternative to H.323
(b) More flexible, simpler
(c) Easier to implement
(d) Better suited to the support of intelligent user devices
(e) A part of IETF multimedia data and control architecture (任選三, 6%)

- INVITE (2%)
  ⇨ Initiate a session with information of the calling and called parties and the type of media
- REGISTER (2%)
  ⇨ Log in and register the address with a SIP server
- REFER (2%)
  ⇨ To enable the sender of the request to instruct the receiver to contact a third party
- OPTION (2%)
  ⇨ Query a server as to its capabilities
- INFO (2%)
  ⇨ For transferring information during an ongoing session
- UPDATE (2%)
  ⇨ To enable the modification of session information before a final response to an INVITE is received

- Contact (2%)
  ⇨ Provides a URL for use in future communication regarding a particular session
- Record-Route (2%)
  ⇨ The information contained in the Record-Route: header is used in the subsequent requests related to the same call
- Via (2%)
  ⇨ Record the path taken by a request
- Allow (2%)
  ⇨ Indicate the SIP methods that servers/clients can handle

- branch=xxx

⇨ A user is registered at several locations (2%)

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   a=rtpmap 15 G728/8000" (2%)
   (d) Explain the meaning of "o=Collins 123456 001 IN IP4 station1.work.com" in SDP. (6%)

Ans:

(a) offer/answer mode for SDP: to reach an agreement between the two parties as to the types of media they are willing to share. (2%)

(b) m=audio 45678 RTP/AVP 2 4 15
media type: audio (1%)
Port: 45678 (1%)
Format: RTP/AVP--- list the various types of media format that can be supported (1%) according to the RTP audio/video profile (1%)
a=rtpmap 2 G726-32/8000
a=rtpmap 4 G723/8000
a=rtpmap 15 G728/8000: 只有一個 port 45678，只希望選一個 media type (2%)

(c) a=rtpmap 2 G726-32/8000
a=rtpmap 4 G723/8000
a=rtpmap 15 G728/8000:有三個 port 45678, 45679, 45680，可以同時選三個 media type (2%)

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(d) Origin (6%)

Username: Collins

Session ID: 123456

Version: 001

Network type: IN refers to Internet

Address type:IP4

Address: station1.work.com (a fully-qualified domain name)

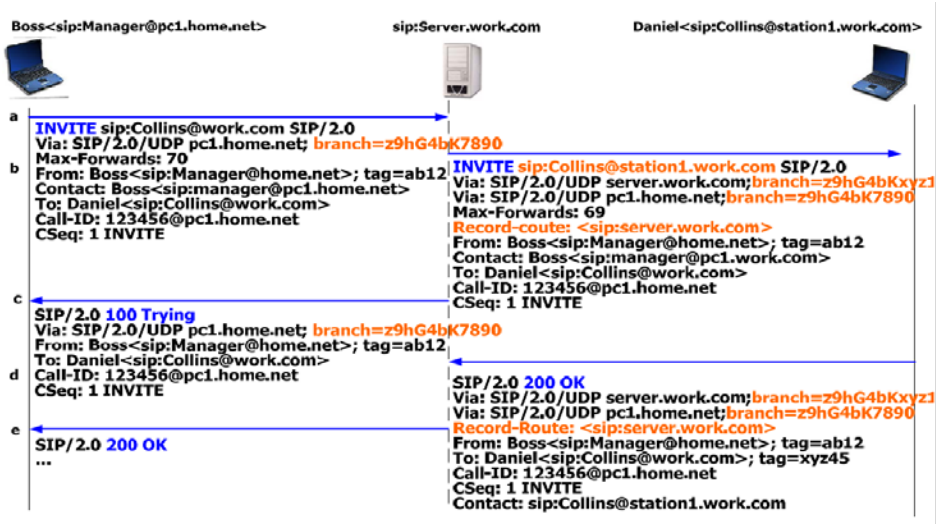
3. Describe and draw the SIP message flow with important headers to start a session via the proxy server. (18%)

Ans: Proxy server: message (1%), header (2%)

INVITE (via, branch), **INVITE** (URI, max-forward, new via, branch, Record-route),

200 OK (new via, branch, Record-route, contact), **200 OK** (via, branch, Record-route, contact),

ACK (URI, Route), **ACK** (URI, Route, new via, branch),



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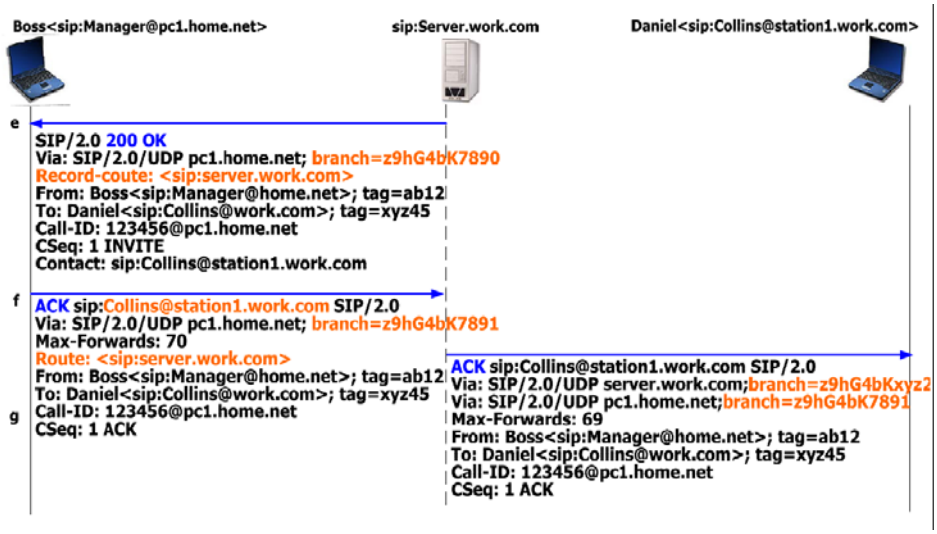

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Ans:

(a)

Proactive Routing Protocol: (6%)

- continuously evaluate the routes
- attempt to maintain consistent, up-to-date routing information
- when a route is needed, one may be ready immediately
- when the network topology changes, the protocol responds by propagating updates throughout the network to maintain a consistent view

Reactive Routing Protocol: (6%)

- on-demand: create routes only when it is desired by the source node
- route discovery: invoke a route-determination procedure
- the procedure is terminated when
  - a route has been found
  - no route is found after all route permutations are examined
- longer delay: sometimes a route may not be ready for use immediately when data packets come

(b) Proactive Routing Protocol: DSDV, CGSR (1%)

Reactive Routing Protocol: DSR, AODV, TORA, ABR, SSA

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Ans:

(a) Data forwarding steps of CGSR: (6%)

- from cluster head to cluster head in a hierarchical manner
- then from cluster head to cluster members
- between two cluster heads, gateways are used to forward the packets

(b) RREQ, RREP, RERR (3% each)

RREQ: when a node wants to communicate with another node, but does not have a route to that node. Source node broadcasts a route request (RREQ) packet to its neighbors

RREP: If a node receives an RREQ packet and it has a current route to the target destination, then it unicasts a route reply packet (RREP) to the neighbor that sent the RREQ packet

RERR: The upstream (toward the source) node detecting a failure propagates a route error (RERR) packet to the source node. The source (or another node on the path) can rebuild a path by sending a RREQ packet

(c) DSR uses Source Routing: (2%)

- routes are denoted with complete information (each hop is registered)
  - There is a "route record" field in the packet.
  - The source node will add its address to the record.
  - On receipt of the packet, a host will add its address to the "route record" and rebroadcast the packet

AODV Uses hop-by-hop routing (2%)

- Routes are based on dynamic table entries maintained at intermediate nodes

(d) How ZRP works in ad hoc network? (6%)

- Hybrid of table-driven and on-demand!!
- From each node, there is a concept of "zone".
  Within each zone, the routing is performed in a table-driven manner (proactive).
- For inter-zone routing, on-demand (reacting) routing is used.