# Mobile Computing Midterm (99/04)

1. What are three advantages of SIP? (6%) Describe functions of SIP INVITE, REGISTER, REFER methods. (6%) What are the usages of SIP Contact, Record-Route headers? (4%)

2. What is the offer/answer mode for SDP? (2%) 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" for media information in SDP. (6%)
   Explain the meaning of "o=Collins 123456 001 IN IP4 station1.work.com" in SDP. (6%)

3. Describe and draw the SIP message flow (含會變動的 header) to start a session via the proxy server. (18%)

4. (a) What is MANET? (2%) (b) List three challenges of MANET. (6%) (8% total)

5. (a) What are two types of Ad Hoc routing protocols? List how they work. (8% each, 16% total) (b) Please classify CGSR, AODV, SSA into the type they belong (3%) (19%).

6. (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) (5%) (e) How ZRP works in ad hoc network? (6%) (25% total)

1. What are three advantages of SIP? (6%) Describe functions of SIP INVITE, REGISTER, REFER methods. (6%) What are the usages of SIP Contact, Record-Route headers? (4%)

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

- 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

2. What is the offer/answer mode for SDP? (2%) 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" for media information in SDP. (6%)
   Explain the meaning of "o=Collins 123456 001 IN IP4 station1.work.com" in SDP. (6%)

Ans:

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%)

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

media type: audio (1%)
Port: 45678, 45679, 45680 (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:有三個 port 45678, 45679, 45680，可以同時選

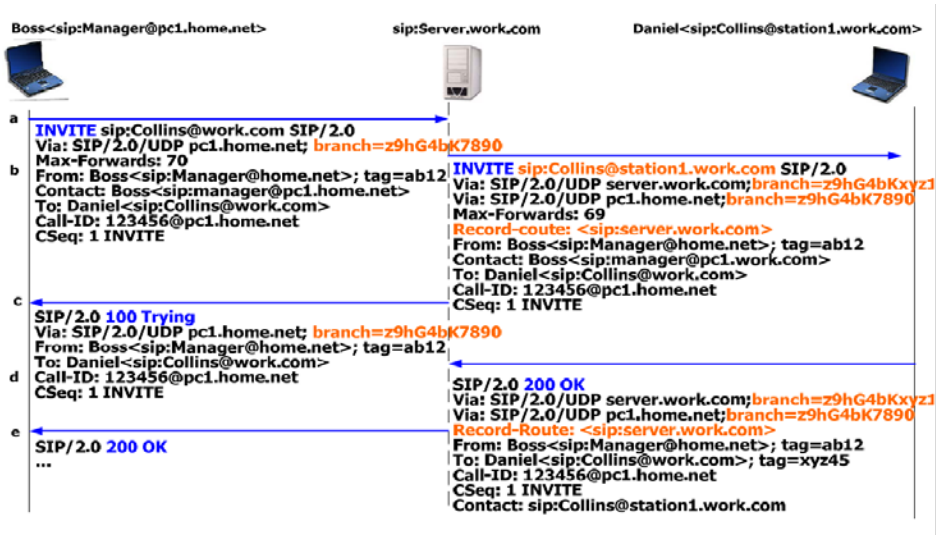
三個 media type (2%)

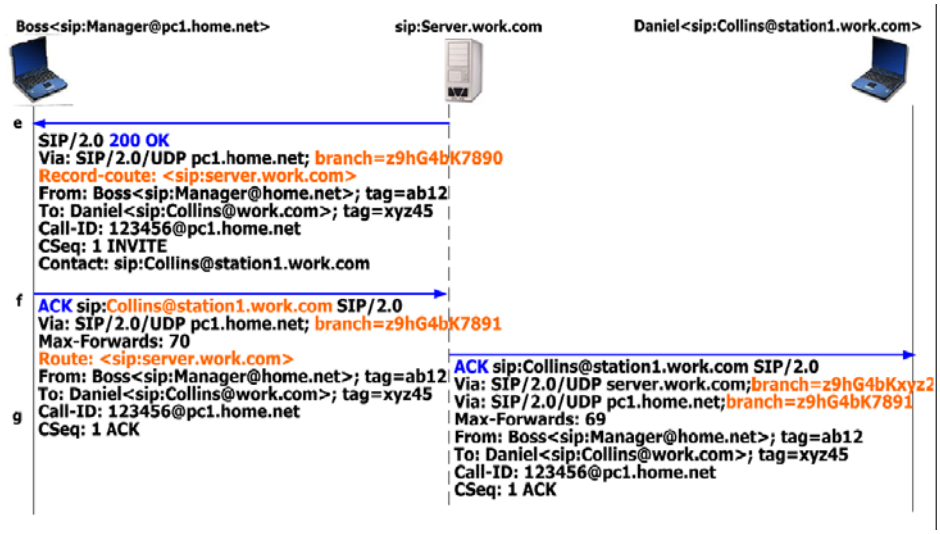
Origin (6%)
Username: Collins
Session ID: 123456
Version: 001
Network type: IN refers to Internet
Address type:IP4
Address: station1.work.com (a fully-qualified domain name)

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

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),




4. (a) What is MANET? (2%) (b) List three technical characteristics of MANET. (6%) (8% total)

Ans:

(a) MANET = Mobile Ad Hoc Networks (2%)

(b) No centralized entity (any three of them, 6%)

Mobile host is no longer just an end system

Acting as an intermediate system

Changing network topology over time

Every node can be mobile

5. (a) What are two types of Ad Hoc routing protocols? List how they work. (8% each, 16% total) (b) Please classify CGSR, AODV, SSA into the type they belong (3%) (19%).

Ans:

(a)

Proactive Routing Protocol: (8%)

- 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: (8%)

- 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: CGSR (3%)
Reactive Routing Protocol: AODV, SSA

6. (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)

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.