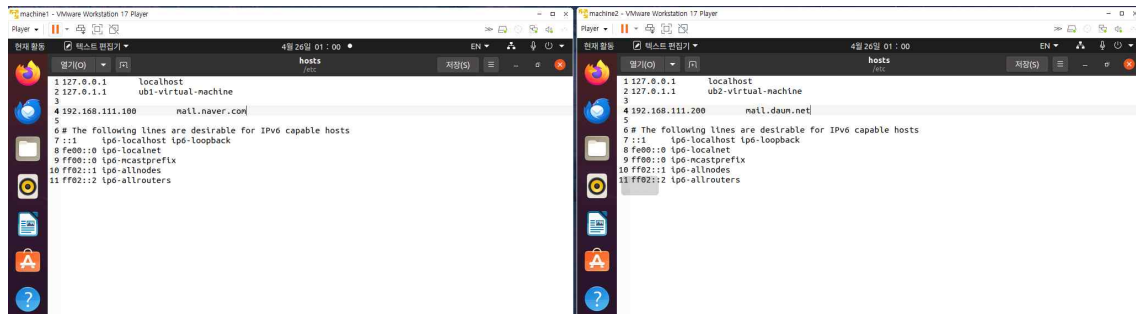


## E-mail 서버 구축 및 실험

---

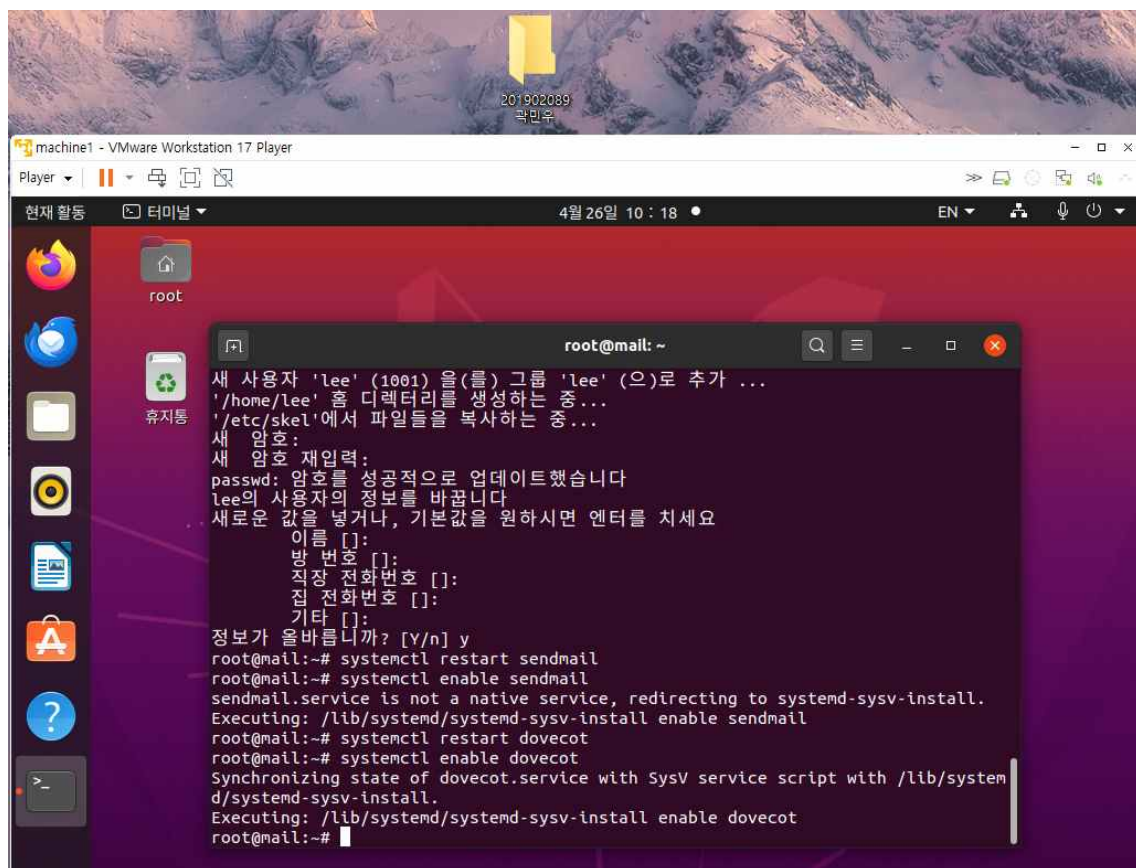
24.04.26

## 1. 샌드메일 서버 설치

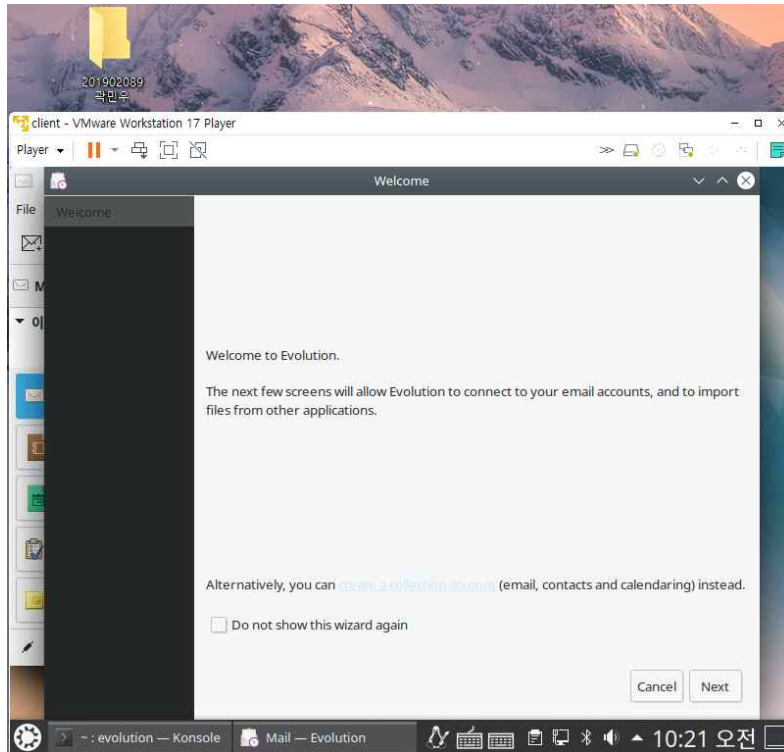


(중간 /etc/hosts 파일 수정과정입니다.)

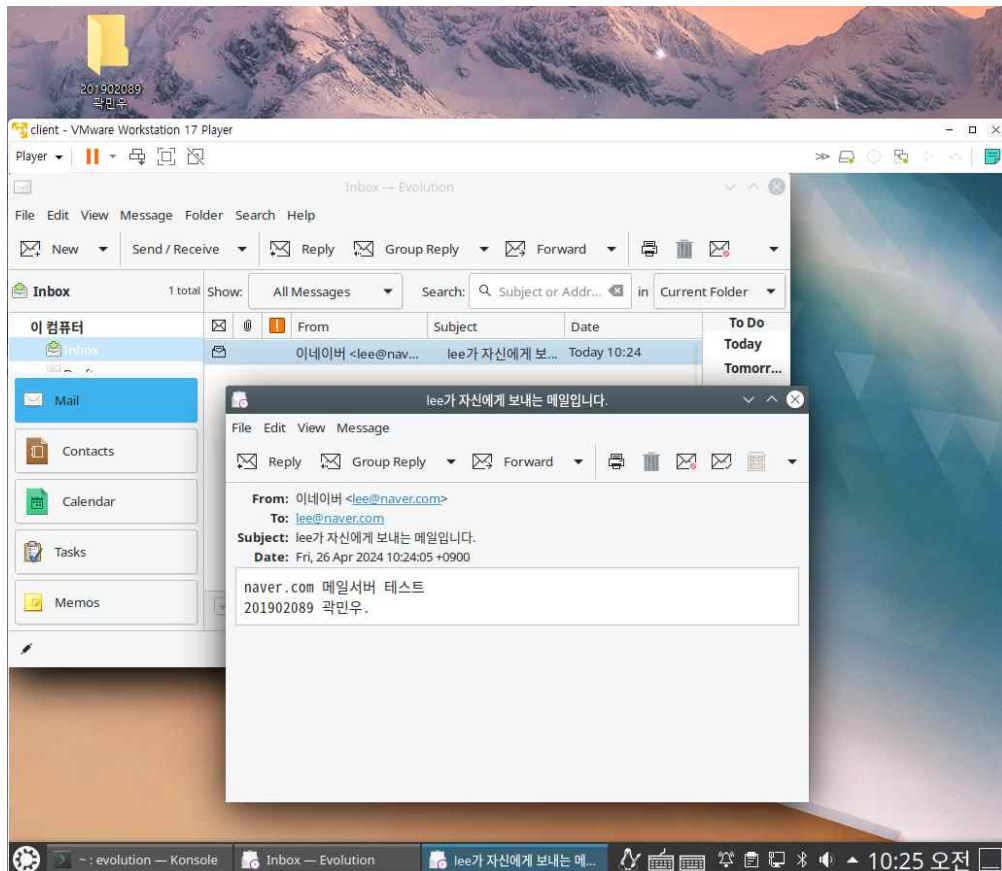
## 2. naver.com 메일서버 구축



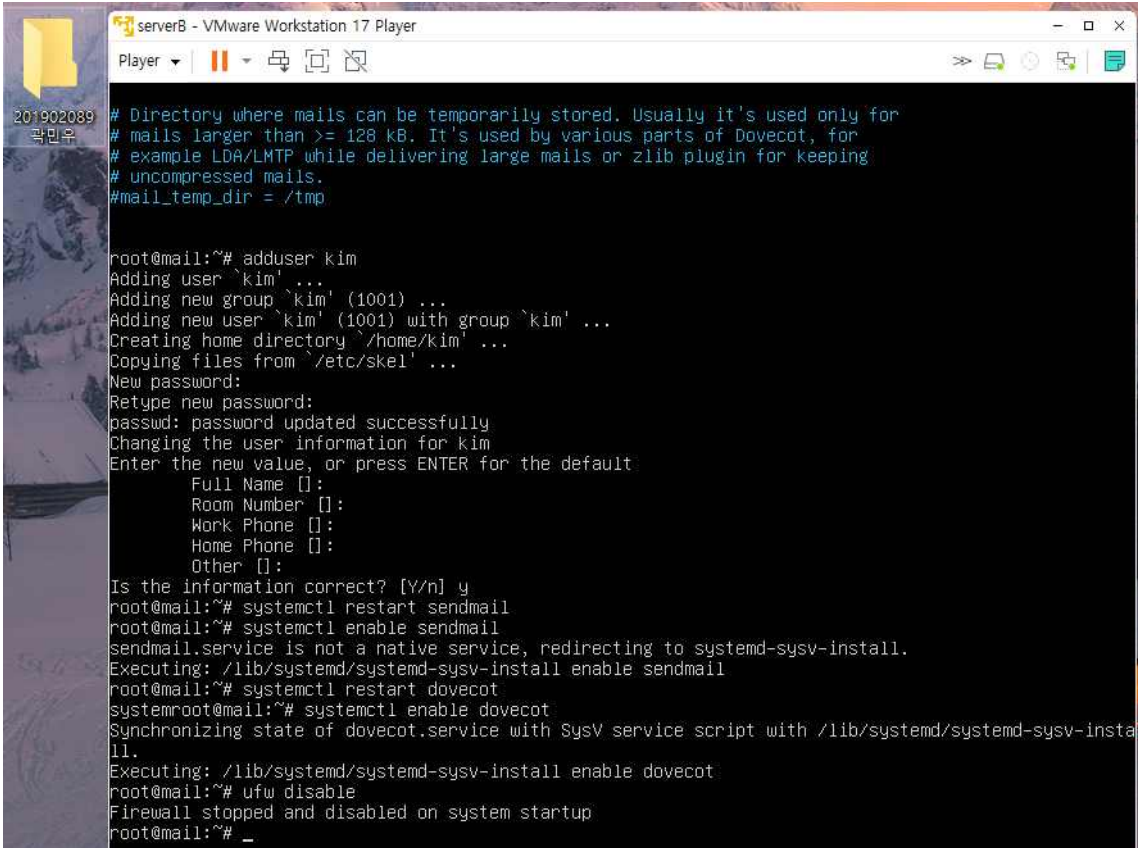
### 3. 메일 client evolution 설치



(자기 자신에게 보내고 잘 수신되는지 확인한 사진입니다.)



#### 4. daum.net 메일서버 구축



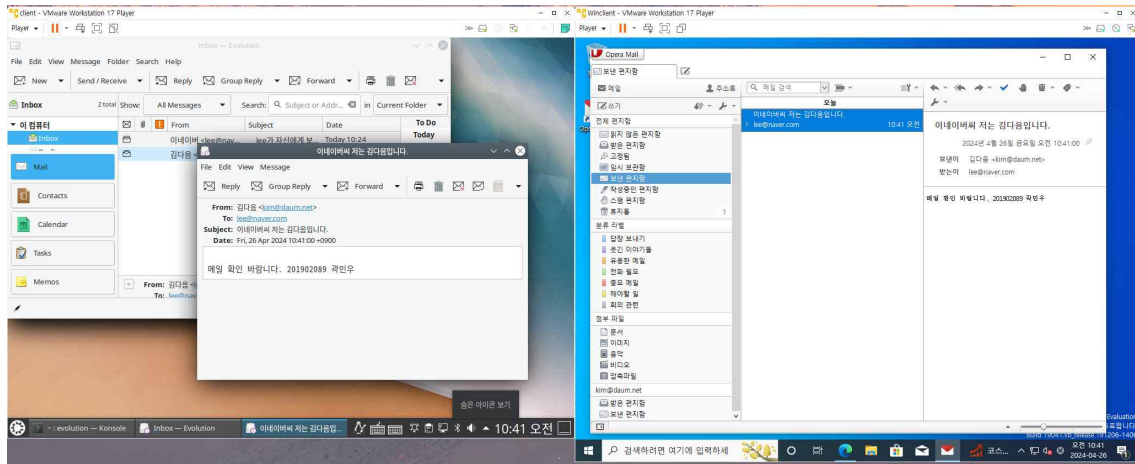
The screenshot shows a VMware Workstation 17 Player window titled "server8 - VMware Workstation 17 Player". The terminal window displays the following commands and output:

```
# Directory where mails can be temporarily stored. Usually it's used only for
# mails larger than >= 128 kB. It's used by various parts of Dovecot, for
# example LDA/LMTP while delivering large mails or zlib plugin for keeping
# uncompressed mails.
#mail_temp_dir = /tmp

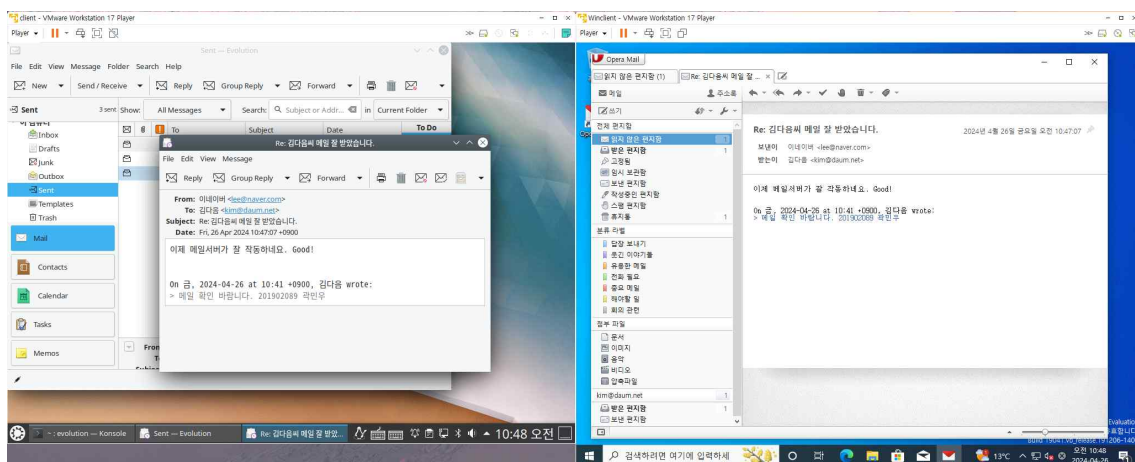
root@mail:~# adduser kim
Adding user `kim' ...
Adding new group `kim' (1001) ...
Adding new user `kim' (1001) with group `kim' ...
Creating home directory `/home/kim' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for kim
Enter the new value, or press ENTER for the default:
    Full Name []:
    Room Number []:
    Work Phone []:
    Home Phone []:
    Other []:
Is the information correct? [Y/n] y
root@mail:~# systemctl restart sendmail
root@mail:~# systemctl enable sendmail
sendmail.service is not a native service, redirecting to systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable sendmail
root@mail:~# systemctl restart dovecot
systemroot@mail:~# systemctl enable dovecot
Synchronizing state of dovecot.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable dovecot
root@mail:~# ufw disable
Firewall stopped and disabled on system startup
root@mail:~# _
```

## 5. Windows 메일 client Opera 설치 실험

kim@daum.net => lee@naver.com



lee@naver.com => kim@daum.net





## 6. 실습 5 과정을 Wireshark로 분석

server A(메일서버) : 192.168.111.100

server B(메일서버) : 192.168.111.200

ubuntu client(Lee) : 192.168.111.130

windows client(Kim) : 192.168.111.133

### 수행된 순서

- Lee가 Kim에게 메시지 전송
- Kim이 받고 회신(reply)
- Lee가 받은 메시지를 확인

### (1) Lee가 메시지를 전송한다.

65	32.924021	UbunClient(Lee)	serverA	TCP	74	41428 → 25 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM TSval=2714872547 TSecr=0 WS=128
66	32.924229	serverA	UbunClient(Lee)	TCP	74	25 → 41428 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM TSval=632845777 TSecr=2714872547 WS=128
67	32.924325	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=2714872548 TSecr=632845777
68	32.925918	serverA	UbunClient(Lee)	TCP	74	45315 → 113 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM TSval=632845779 TSecr=0 WS=128
69	32.926094	UbunClient(Lee)	serverA	TCP	60	113 → 45315 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
70	33.929838	serverA	UbunClient(Lee)	SMTP	235	S: 220 mail.naver.com ESMTP Sendmail 8.15.2/8.15.2/Debian-18; Fri, 26 Apr 2024 10:57:59 +0900; (No UCE/UBE) 1c
71	33.929949	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=1 Ack=170 Win=64128 Len=0 TSval=2714873553 TSecr=632846783
72	33.930268	UbunClient(Lee)	serverA	DNS	99	Standard query 0x8132 PTR 130.111.168.192.in-addr.arpa OPT
73	33.930513	serverA	UbunClient(Lee)	DNS	154	Standard query response 0x8132 No such name PTR 130.111.168.192.in-addr.arpa SOA 168.192.IN-ADDR.ARPA OPT
74	33.930790	UbunClient(Lee)	serverA	DNS	88	Standard query 0x8132 PTR 130.111.168.192.in-addr.arpa
75	33.930945	serverA	UbunClient(Lee)	DNS	143	Standard query response 0x8132 No such name PTR 130.111.168.192.in-addr.arpa SOA 168.192.IN-ADDR.ARPA
76	33.931648	UbunClient(Lee)	serverA	SMTP	79	C: EHLO client
77	33.931758	serverA	UbunClient(Lee)	TCP	66	25 → 41428 [ACK] Seq=170 Ack=14 Win=65280 Len=0 TSval=632846785 TSecr=2714873555
78	33.931825	serverA	UbunClient(Lee)	SMTP	290	S: 250-mail.naver.com Hello [192.168.111.130], pleased to meet you   ENHANCEDSTATUSCODES   PIPELINING   EXPN
79	33.931883	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=14 Ack=394 Win=64128 Len=0 TSval=2714873555 TSecr=632846785
80	33.932239	UbunClient(Lee)	serverA	SMTP	93	C: MAIL FROM:<lee@naver.com>
81	33.932781	serverA	UbunClient(Lee)	SMTP	106	S: 250 2.1.0 <lee@naver.com>... Sender ok
82	33.932860	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=41 Ack=434 Win=64128 Len=0 TSval=2714873556 TSecr=632846786
83	33.952839	UbunClient(Lee)	serverA	SMTP	90	C: RCPT TO:<kim@daum.net>
84	33.953699	serverA	UbunClient(Lee)	SMTP	108	S: 250 2.1.5 <kim@daum.net>... Recipient ok
85	33.953867	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=65 Ack=476 Win=64128 Len=0 TSval=2714873577 TSecr=632846807
86	33.954011	UbunClient(Lee)	serverA	SMTP	72	C: DATA
87	33.954164	serverA	UbunClient(Lee)	SMTP	116	S: 354 Enter mail, end with "." on a line by itself
88	33.954336	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=71 Ack=526 Win=64128 Len=0 TSval=2714873578 TSecr=632846807
89	33.954446	UbunClient(Lee)	serverA	SMTP	138	C: DATA fragment, 72 bytes
90	34.006466	serverA	UbunClient(Lee)	TCP	66	25 → 41428 [ACK] Seq=526 Ack=143 Win=65280 Len=0 TSval=632846859 TSecr=2714873578
91	34.006612	UbunClient(Lee)	serverA	SMTP/...	412	subject: test, from: =?euc-kr?Q?=C0=C8=B3=D7=C0=CC=B9=F6?= <lee@naver.com>, (text/plain)
92	34.006812	serverA	UbunClient(Lee)	TCP	66	25 → 41428 [ACK] Seq=526 Ack=489 Win=65024 Len=0 TSval=632846860 TSecr=2714873630
93	34.010671	serverA	serverB	TCP	74	58842 → 25 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM TSval=475923175 TSecr=0 WS=128
94	34.010795	serverA	UbunClient(Lee)	SMTP	122	S: 250 2.0.0 43Q1vxoG007503 Message accepted for delivery
95	34.010817	serverB	serverA	TCP	74	25 → 58842 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM TSval=1811744346 TSecr=475923175 WS=128
96	34.010884	UbunClient(Lee)	serverA	TCP	66	41428 → 25 [ACK] Seq=489 Ack=582 Win=64128 Len=0 TSval=2714873634 TSecr=632846864
97	34.010925	serverA	serverB	TCP	66	58842 → 25 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=475923175 TSecr=1811744346
98	34.011093	UbunClient(Lee)	serverA	SMTP	72	C: QUIT
99	34.011216	serverA	UbunClient(Lee)	SMTP	111	S: 221 2.0.0 mail.naver.com closing connection

- 65~67 : 25번 포트로 TCP connection 개설
- 70 : MTA server가 220 service Ready 전송 (71: ACK)
- 76 : HELO client 전송, 여기에 domain name은 보이지 않았습니다. (77: ACK)
- 78 : 250 (OK)를 보냄 (79: ACK)

UbunClient(Lee)	serverA	SMTP	... C: MAIL FROM:<lee@naver.com>
serverA	UbunClient(Lee)	SMTP	... S: 250 2.1.0 <lee@naver.com>... Sender ok
UbunClient(Lee)	serverA	TCP	... 41428 → 25 [ACK] Seq=41 Ack=434 Win=64128 Le
UbunClient(Lee)	serverA	SMTP	... C: RCPT TO:<kim@daum.net>
serverA	UbunClient(Lee)	SMTP	... S: 250 2.1.5 <kim@daum.net>... Recipient ok
UbunClient(Lee)	serverA	TCP	... 41428 → 25 [ACK] Seq=65 Ack=476 Win=64128 Le

- 80~85 : MAIL FROM, RCPT TO를 사용하여 송신자, 수신자 표시, 보낼 때마다 250(OK)을 보냄
- 86: DATA command 전송
- 87: code 354, 이제 내용을 입력하라고 지시(끝은 '.'을 적도록 함) (88: ACK)

- 89~92 : 데이터(내용) 전송(90, 92는 ACK)

```

Frame 89: 138 bytes on wire (1104 bits), 138 bytes captured (1104 bits) on interface \Device\NPF_{B
Ethernet II, Src: UbunClient(Lee) (00:0c:29:c3:bc:f4), Dst: serverA (00:0c:29:b5:3a:45)
Internet Protocol Version 4, Src: UbunClient(Lee) (192.168.111.130), Dst: serverA (192.168.111.100)
Transmission Control Protocol, Src Port: 41428, Dst Port: 25, Seq: 71, Ack: 526, Len: 72
Simple Mail Transfer Protocol
  Line-based text data (1 lines)
    Message-ID: <a84b8cfb564e117b3628faa74fa40a4fb695bbef.camel@naver.com>\r\n
    [Reassembled DATA in frame: 91]

```

```

Frame 91: 412 bytes on wire (3296 bits), 412 bytes captured (3296 bits) on interface \Device\NPF_{B
Ethernet II, Src: UbunClient(Lee) (00:0c:29:c3:bc:f4), Dst: serverA (00:0c:29:b5:3a:45)
Internet Protocol Version 4, Src: UbunClient(Lee) (192.168.111.130), Dst: serverA (192.168.111.100)
Transmission Control Protocol, Src Port: 41428, Dst Port: 25, Seq: 143, Ack: 526, Len: 346
Simple Mail Transfer Protocol
  C: .
  [2 DATA fragments (413 bytes): #89(72), #91(341)]
    [Frame: 89, payload: 0-71 (72 bytes)]
    [Frame: 91, payload: 72-412 (341 bytes)]
    [DATA fragment count: 2]
    [Reassembled DATA length: 413]

```

```

Internet Message Format
  Message-ID: <a84b8cfb564e117b3628faa74fa40a4fb695bbef.camel@naver.com>
  Subject: test
  > From: =?euc-kr?Q?=C0=CC=B3=D7=C0=CC=B9=F6?= <lee@naver.com>, 1 item
  > To: kim@daum.net, 1 item
  Date: Fri, 26 Apr 2024 10:57:59 +0900
  > Content-Type: text/plain; charset="UTF-8"
  User-Agent: Evolution 3.36.1-2
  MIME-Version: 1.0
  Content-Transfer-Encoding: base64
  Line-based text data: text/plain (1 lines)
    Lee가 Kim에게 보내는 메시지 확인 바람\r\n

```

제목(subject)은 test, 가장 밑에 메일의 내용을 볼 수 있습니다.

- Content-Type : text/plain      - Content-Transfer-Encoding으로 Base64 사용

- 94, 96, 98, 99 : 메시지를 보낼 준비를 마치고 연결 해제 과정(100~102는 TCP의 Closing)

93	34.010671	serverA	serverB	TCP	... 58842 → 25 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM
94	34.010795	serverA	UbunClient(Lee)	SMTP	... S: 250 2.0.0 43Q1vx0G007503 Message accepted for delivery
95	34.010817	serverB	serverA	TCP	... 25 → 58842 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460
96	34.010884	UbunClient(Lee)	serverA	TCP	... 41428 → 25 [ACK] Seq=489 Ack=582 Win=64128 Len=0 TSval=271
97	34.010925	serverA	serverB	TCP	... 58842 → 25 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=4759231
98	34.011093	UbunClient(Lee)	serverA	SMTP	... C: QUIT
99	34.011216	serverA	UbunClient(Lee)	SMTP	... S: 221 2.0.0 mail.naver.com closing connection
00	34.011269	serverA	UbunClient(Lee)	TCP	... 25 → 41428 [FIN, ACK] Seq=627 Ack=495 Win=65024 Len=0 TSva
01	34.011431	UbunClient(Lee)	serverA	TCP	... 41428 → 25 [FIN, ACK] Seq=495 Ack=628 Win=64128 Len=0 TSva
02	34.011493	serverA	UbunClient(Lee)	TCP	... 25 → 41428 [ACK] Seq=628 Ack=496 Win=65024 Len=0 TSval=632

- 99번은 221번 code를 사용해서 연결 해제 절차를 거친 모습입니다.

- 이와 동시에 두 메일서버 간 연결 설정 진행(93, 95, 97). 이때 또한 25번 포트 사용

serverB	serverA	SMTP	... S: 220 mail.daum.net ESMTP Sendmail 8.15.2/8.15.2/Debian-18; Fri, 26 Apr 2024 01:58:01
serverA	serverB	TCP	... 58842 → 25 [ACK] Seq=1 Ack=167 Win=64128 Len=0 TSval=475924180 TSecr=1811745351
serverA	serverB	SMTP	... C: EHLO mail.naver.com
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=167 Ack=22 Win=65280 Len=0 TSval=1811745352 TSecr=475924180
serverB	serverA	SMTP	... S: 250-mail.daum.net Hello [192.168.111.100], pleased to meet you   ENHANCEDSTATUSCODE=
serverA	serverB	SMTP	... C: MAIL From:<lee@naver.com> SIZE=578
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=390 Ack=58 Win=65280 Len=0 TSval=1811745352 TSecr=475924181
serverB	serverA	DNS	... Standard query 0xb4f6 AAAA naver.com OPT
serverA	serverB	DNS	... Standard query response 0xb4f6 AAAA naver.com SOA naver.com OPT
serverB	serverA	SMTP	... S: 250 2.1.0 <lee@naver.com>... Sender ok
serverA	serverB	SMTP	... C: RCPT To:<kim@daum.net>   DATA
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=430 Ack=88 Win=65280 Len=0 TSval=1811745353 TSecr=475924182
serverB	serverA	DNS	... Standard query 0x7c0f AAAA daum.net OPT
serverA	serverB	DNS	... Standard query response 0x7c0f AAAA daum.net SOA daum.net OPT
serverB	serverA	SMTP	... S: 250 2.1.5 <kim@daum.net>... Recipient ok   354 Enter mail, end with "." on a line b
serverA	serverB	SMTP	... C: DATA fragment, 587 bytes
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=522 Ack=675 Win=64768 Len=0 TSval=1811745354 TSecr=475924183
serverA	serverB	SMTP/IMF	... subject: test, from: =?euc-kr?Q?=C0=CC=B3=D7=C0=CC=B9=F6?= <lee@naver.com>, (text/pla
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=522 Ack=678 Win=64768 Len=0 TSval=1811745354 TSecr=475924183
serverB	serverA	SMTP	... S: 250 2.0.0 43Q1w1lW007636 Message accepted for delivery
serverA	serverB	SMTP	... C: QUIT
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=578 Ack=684 Win=64768 Len=0 TSval=1811745357 TSecr=475924186
serverB	serverA	SMTP	... S: 221 2.0.0 mail.daum.net closing connection
serverB	serverA	TCP	... 25 → 58842 [FIN, ACK] Seq=622 Ack=684 Win=64768 Len=0 TSval=1811745357 TSecr=475924186
serverA	serverB	TCP	... 58842 → 25 [FIN, ACK] Seq=684 Ack=622 Win=64128 Len=0 TSval=475924186 TSecr=1811745357
serverB	serverA	TCP	... 25 → 58842 [ACK] Seq=623 Ack=685 Win=64768 Len=0 TSval=1811745357 TSecr=475924186
serverA	serverB	TCP	... 58842 → 25 [ACK] Seq=685 Ack=623 Win=64128 Len=0 TSval=475924186 TSecr=1811745357

-여기서는 메일서버 간 전송이 이루어지는데, 앞에서 server A와 Lee가 한 방식과 동일합니다.



## (2) Kim이 메일을 받고 Reply 하는 과정

171	45.965051	WinClient(Kim)	serverB	TCP	... 52579 → 110 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM
172	45.965198	serverB	WinClient(Kim)	TCP	... 110 → 52579 [SYN, ACK] Seq=0 Ack=1 Win=64240 Len=0 MSS=1460 SACK_F
173	45.965360	WinClient(Kim)	serverB	TCP	... 52579 → 110 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
174	45.968637	serverB	WinClient(Kim)	POP	... S: +OK Dovecot (Ubuntu) ready.
175	45.968902	WinClient(Kim)	serverB	POP	... C: CAPA
176	45.968985	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=30 Ack=7 Win=64256 Len=0
177	45.969042	serverB	WinClient(Kim)	POP	... S: +OK
178	45.969223	WinClient(Kim)	serverB	POP	... C: USER kim
179	45.969288	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=119 Ack=17 Win=64256 Len=0
180	45.969336	serverB	WinClient(Kim)	POP	... S: +OK
181	45.969532	WinClient(Kim)	serverB	POP	... C: PASS kim
182	45.969820	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=124 Ack=27 Win=64256 Len=0
183	45.977653	serverB	WinClient(Kim)	POP	... S: +OK Logged in.
184	45.978024	WinClient(Kim)	serverB	POP	... C: CAPA
185	45.978135	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=140 Ack=33 Win=64256 Len=0
186	45.978246	serverB	WinClient(Kim)	POP	... S: +OK
187	45.978458	WinClient(Kim)	serverB	POP	... C: UIDL
188	45.978499	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=205 Ack=39 Win=64256 Len=0
189	45.978582	serverB	WinClient(Kim)	POP	... S: +OK
190	45.978835	WinClient(Kim)	serverB	POP	... C: LIST
191	45.978873	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=253 Ack=45 Win=64256 Len=0
192	45.978932	serverB	WinClient(Kim)	POP	... S: +OK 2 messages:
193	45.979403	WinClient(Kim)	serverB	POP	... C: RETR 2
194	45.979438	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=288 Ack=53 Win=64256 Len=0
195	45.979541	serverB	WinClient(Kim)	POP	... S: +OK 844 octets
196	46.006364	WinClient(Kim)	serverB	POP	... C: QUIT
197	46.006441	serverB	WinClient(Kim)	TCP	... 110 → 52579 [ACK] Seq=1151 Ack=59 Win=64256 Len=0
198	46.007084	serverB	WinClient(Kim)	POP	... S: +OK Logging out.
199	46.007157	WinClient(Kim)	serverB	TCP	... 52579 → 110 [ACK] Seq=59 Ack=1170 Win=2100992 Len=0

- 171~173: Kim과 serverB가 110번 포트를 이용해 연결하는 과정
- 174~183: username과 password로 Dovecot(pop3)에 로그인하는 과정
- 190: List로 이메일 번호와 크기를 불러옵니다. (192는 그 결과를 보여줍니다.)

### Post Office Protocol

- ```

▼ +OK 2 messages:\r\n
    Response indicator: +OK
    Response description: 2 messages:
    1 1245\r\n
    2 844\r\n
    .\r\n
- 193 : 그중 2번째 것을 Retrieve 하라고 지시합니다.
- 195 : serverB가 그것을 return 합니다.

```

Frame 195: 917 bytes on wire (7336 bits), 917 bytes captured (7336 bits) on interface Ethernet II, Src: serverB (00:0c:29:20:31:79), Dst: WinClient(Kim) (00:0c:29:37:e2: Internet Protocol Version 4, Src: serverB (192.168.111.200), Dst: WinClient(Kim) (1 Transmission Control Protocol, Src Port: 110, Dst Port: 52579, Seq: 288, Ack: 53, L Post Office Protocol

```

▼ +OK 844 octets\r\n
    Response indicator: +OK
    Response description: 844 octets
    Return-Path: <lee@naver.com>\r\n
    Received: from mail.naver.com ([192.168.111.100])\r\n
    \tbody mail.daum.net (8.15.2/8.15.2/Debian-18) with ESMTP id 43Q1w11W007636\r\n
    \tfor <kim@daum.net>; Fri, 26 Apr 2024 01:58:02 GMT\r\n
    Received: from client ([192.168.111.130])\r\n
    \tbody mail.naver.com (8.15.2/8.15.2/Debian-18) with ESMTP id 43Q1vx0G007503\r\n
    \tfor <kim@daum.net>; Fri, 26 Apr 2024 10:58:01 +0900\r\n
    Message-ID: <a84b8cfb564e117b3628faa74fa40a4fb695bbef.camel@naver.com>\r\n
    Subject: test\r\n
    From: =?euc-kr?Q?C0=CC=B3=D7=C0=CC=B9=F6?= <lee@naver.com>\r\n
    To: kim@daum.net\r\n
    Date: Fri, 26 Apr 2024 10:57:59 +0900\r\n
    Content-Type: text/plain; charset="UTF-8"\r\n
    User-Agent: Evolution 3.36.1-2 \r\n
    MIME-Version: 1.0\r\n
    Content-Transfer-Encoding: 8bit\r\n
    X-MIME-Autoconverted: from base64 to 8bit by mail.daum.net id 43Q1w11W007636\r\n
    \r\n
    Lee가 Kim에게 보내는 메시지 확인 바람\r\n
    .\r\n

```

정상적으로 메시지가 수신된 것을 볼 수 있습니다.

## test

보낸이 이네이버 <lee@naver.com>

받는이 kim@daum.net

Lee가 Kim에게 보내는 메시지 확인 바람

- 196~201 : 이후 연결 해제 절차입니다.

|               |                |                |     |                                                              |
|---------------|----------------|----------------|-----|--------------------------------------------------------------|
| 200 46.016808 | WinClient(Kim) | serverB        | TCP | ... 52579 → 110 [FIN, ACK] Seq=59 Ack=1170 Win=2100992 Len=0 |
| 201 46.016917 | serverB        | WinClient(Kim) | TCP | ... 110 → 52579 [ACK] Seq=1170 Ack=60 Win=64256 Len=0        |

(3) Kim이 Lee에게 답장하기

이제 반대로 Kim이 Lee에게 이메일을 보냅니다. 과정을 앞과 같습니다.

|               |                |                |          |                                                                                                         |
|---------------|----------------|----------------|----------|---------------------------------------------------------------------------------------------------------|
| 277 85.531370 | WinClient(Kim) | serverB        | TCP      | ... 52580 → 25 [SYN] Seq=0 Win=64240 Len=0 MSS=1460                                                     |
| 278 85.531499 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [SYN, ACK] Seq=0 Ack=1 Win=64240 Len=0                                                   |
| 279 85.531583 | WinClient(Kim) | serverB        | TCP      | ... 52580 → 25 [ACK] Seq=1 Ack=1 Win=2102272 Len=0                                                      |
| 297 91.535972 | serverB        | WinClient(Kim) | SMTP     | ... S: 220 mail.daum.net ESMTP Sendmail 8.15.2/8.15.2/Debian-18; Fri, 26 Apr 2024 01:58:57 GMT          |
| 298 91.536759 | WinClient(Kim) | serverB        | SMTP     | ... C: EHLO desktop-oeju5p7.localdomain                                                                 |
| 299 91.536852 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=167 Ack=35 Win=64256 Len=0                                                     |
| 300 91.536912 | serverB        | WinClient(Kim) | SMTP     | ... S: 250-mail.daum.net Hello [192.168.111.133], pleased to meet you   ENHANCEDSTATUSCODES             |
| 301 91.537130 | WinClient(Kim) | serverB        | SMTP     | ... C: MAIL FROM:<kim@daum.net>                                                                         |
| 302 91.537199 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=390 Ack=61 Win=64256 Len=0                                                     |
| 303 91.537449 | serverB        | serverA        | DNS      | ... Standard query 0xba84 AAAA daum.net OPT                                                             |
| 304 91.537615 | serverB        | serverA        | DNS      | ... Standard query response 0xba84 AAAA daum.net SOA daum.net OPT                                       |
| 305 91.537940 | serverB        | WinClient(Kim) | SMTP     | ... S: 250 2.1.0 <kim@daum.net>... Sender ok                                                            |
| 306 91.538186 | WinClient(Kim) | serverB        | SMTP     | ... C: RCPT TO:<lee@naver.com>                                                                          |
| 307 91.538253 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=429 Ack=86 Win=64256 Len=0                                                     |
| 308 91.538388 | serverB        | serverA        | DNS      | ... Standard query 0x8f8e AAAA naver.com OPT                                                            |
| 309 91.538495 | serverA        | serverB        | DNS      | ... Standard query response 0x8f8e AAAA naver.com SOA naver.com OPT                                     |
| 310 91.538979 | serverB        | WinClient(Kim) | SMTP     | ... S: 250 2.1.5 <lee@naver.com>... Recipient ok                                                        |
| 311 91.539174 | WinClient(Kim) | serverB        | SMTP     | ... C: DATA                                                                                             |
| 312 91.539244 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=472 Ack=92 Win=64256 Len=0                                                     |
| 313 91.539308 | serverB        | WinClient(Kim) | SMTP     | ... S: 354 Enter mail, end with "." on a line by itself                                                 |
| 314 91.539482 | WinClient(Kim) | serverB        | SMTP     | ... C: DATA fragment, 744 bytes                                                                         |
| 315 91.539548 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=522 Ack=836 Win=64128 Len=0                                                    |
| 316 91.539592 | WinClient(Kim) | serverB        | SMTP/IMF | ... subject: Re: test2, from: =>euc-kr?B?sei02cC9?=<kim@daum.net>, (text/plain)                         |
| 317 91.539627 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=522 Ack=841 Win=64128 Len=0                                                    |
| 318 91.544629 | serverB        | serverA        | TCP      | ... 46954 → 25 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM TSval=1811801879 TSecr=0 WS=128           |
| 319 91.544672 | serverB        | WinClient(Kim) | SMTP     | ... S: 250 2.0.0 43Q1wvqQ007664 Message accepted for delivery                                           |
| 320 91.544708 | serverA        | serverB        | TCP      | ... 25 → 46954 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM TSval=475980708 TSecr=0 WS=128 |
| 321 91.544799 | serverB        | serverA        | TCP      | ... 46954 → 25 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=1811801879 TSecr=475980708                       |
| 322 91.546197 | serverA        | serverB        | TCP      | ... 43789 → 113 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM TSval=475980709 TSecr=0 WS=128           |
| 323 91.546239 | serverB        | serverA        | TCP      | ... 113 → 43789 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0                                                      |
| 324 91.551803 | WinClient(Kim) | serverB        | SMTP     | ... C: QUIT                                                                                             |
| 325 91.551909 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=578 Ack=847 Win=64128 Len=0                                                    |
| 326 91.552001 | serverB        | WinClient(Kim) | SMTP     | ... S: 221 2.0.0 mail.daum.net closing connection                                                       |
| 327 91.552094 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [FIN, ACK] Seq=622 Ack=847 Win=64128 Len=0                                               |
| 328 91.552161 | WinClient(Kim) | serverB        | TCP      | ... 52580 → 25 [ACK] Seq=847 Ack=623 Win=2101760 Len=0                                                  |
| 329 91.552209 | WinClient(Kim) | serverB        | TCP      | ... 52580 → 25 [FIN, ACK] Seq=847 Ack=623 Win=2101760 Len=0                                             |
| 330 91.552235 | serverB        | WinClient(Kim) | TCP      | ... 25 → 52580 [ACK] Seq=623 Ack=848 Win=64128 Len=0                                                    |

- 25번 port로 연결 설정(277~279) => EHLO로 이메일 보낼 것 명시(298) => MAIL FROM과 RCPT TO로 보내는 주소와 받는 주소 설정(301, 306) => 메일 작성(DATA, 311~317)

- 동시에 serverA와 serverB 간 연결 설정 절차(318, 320, 322)

- Kim과 serverB간 연결 해제 절차

|               |                |                |      |                                                             |
|---------------|----------------|----------------|------|-------------------------------------------------------------|
| 324 91.551803 | WinClient(Kim) | serverB        | SMTP | ... C: QUIT                                                 |
| 325 91.551909 | serverB        | WinClient(Kim) | TCP  | ... 25 → 52580 [ACK] Seq=578 Ack=847 Win=64128 Len=0        |
| 326 91.552001 | serverB        | WinClient(Kim) | SMTP | ... S: 221 2.0.0 mail.daum.net closing connection           |
| 327 91.552094 | serverB        | WinClient(Kim) | TCP  | ... 25 → 52580 [FIN, ACK] Seq=622 Ack=847 Win=64128 Len=0   |
| 328 91.552161 | WinClient(Kim) | serverB        | TCP  | ... 52580 → 25 [ACK] Seq=847 Ack=623 Win=2101760 Len=0      |
| 329 91.552209 | WinClient(Kim) | serverB        | TCP  | ... 52580 → 25 [FIN, ACK] Seq=847 Ack=623 Win=2101760 Len=0 |
| 330 91.552235 | serverB        | WinClient(Kim) | TCP  | ... 25 → 52580 [ACK] Seq=623 Ack=848 Win=64128 Len=0        |

- serverB가 serverA에게로 이메일을 보내는 절차(앞과 같습니다.)

|     |           |         |         |          |                                                                                         |
|-----|-----------|---------|---------|----------|-----------------------------------------------------------------------------------------|
| 331 | 92.548928 | serverA | serverB | SMTP     | ... S: 220 mail.naver.com ESMTP Sendmail 8.15.2/8.15.2/Debian-18; Fri, 26 Apr 2024 10:5 |
| 332 | 92.549111 | serverB | serverA | TCP      | ... 46954 → 25 [ACK] Seq=1 Ack=170 Win=64128 Len=0 TSval=1811802883 TSecr=475981712     |
| 333 | 92.549190 | serverB | serverA | SMTP     | ... C: EHLO mail.daum.net                                                               |
| 334 | 92.549306 | serverA | serverB | TCP      | ... 25 → 46954 [ACK] Seq=170 Ack=21 Win=65280 Len=0 TSval=475981713 TSecr=1811802883    |
| 335 | 92.549371 | serverA | serverB | SMTP     | ... S: 250-mail.naver.com Hello [192.168.111.200], pleased to meet you   ENHANCEDSTATUS |
| 336 | 92.549468 | serverB | serverA | TCP      | ... 46954 → 25 [ACK] Seq=21 Ack=394 Win=64128 Len=0 TSval=1811802884 TSecr=475981713    |
| 337 | 92.549792 | serverB | serverA | SMTP     | ... C: MAIL From:<kim@daum.net> SIZE=922                                                |
| 338 | 92.550369 | serverA | serverB | SMTP     | ... S: 250 2.1.0 <kim@daum.net>... Sender ok                                            |
| 339 | 92.550442 | serverB | serverA | TCP      | ... 46954 → 25 [ACK] Seq=56 Ack=433 Win=64128 Len=0 TSval=1811802885 TSecr=475981714    |
| 340 | 92.550650 | serverB | serverA | SMTP     | ... C: RCPT To:<lee@naver.com>   DATA                                                   |
| 341 | 92.551502 | serverA | serverB | SMTP     | ... S: 250 2.1.5 <lee@naver.com>... Recipient ok   354 Enter mail, end with "." on a li |
| 342 | 92.551586 | serverB | serverA | TCP      | ... 46954 → 25 [ACK] Seq=87 Ack=526 Win=64128 Len=0 TSval=1811802886 TSecr=475981715    |
| 343 | 92.551756 | serverB | serverA | SMTP     | ... C: DATA fragment, 937 bytes                                                         |
| 344 | 92.610357 | serverA | serverB | TCP      | ... 25 → 46954 [ACK] Seq=526 Ack=1024 Win=64384 Len=0 TSval=475981774 TSecr=1811802886  |
| 345 | 92.610630 | serverB | serverA | SMTP/IMF | ... subject: Re: test2, from: =?euc-kr?B?se102cc9?= <kim@daum.net>, (text/plain)        |
| 346 | 92.611457 | serverA | serverB | TCP      | ... 25 → 46954 [ACK] Seq=526 Ack=1027 Win=64384 Len=0 TSval=475981775 TSecr=1811802945  |
| 347 | 92.612669 | serverA | serverB | SMTP     | ... S: 250 2.0.0 43Q1wYr007507 Message accepted for delivery                            |
| 348 | 92.612754 | serverB | serverA | TCP      | ... 46954 → 25 [ACK] Seq=1027 Ack=582 Win=64128 Len=0 TSval=1811802947 TSecr=475981776  |
| 349 | 92.613862 | serverB | serverA | SMTP     | ... C: QUIT                                                                             |
| 350 | 92.613943 | serverA | serverB | SMTP     | ... S: 221 2.0.0 mail.naver.com closing connection                                      |
| 351 | 92.613984 | serverB | serverA | TCP      | ... 46954 → 25 [ACK] Seq=1033 Ack=627 Win=64128 Len=0 TSval=1811802948 TSecr=475981777  |
| 352 | 92.613994 | serverA | serverB | TCP      | ... 25 → 46954 [FIN, ACK] Seq=627 Ack=1033 Win=64384 Len=0 TSval=475981777 TSecr=181180 |
| 353 | 92.614080 | serverB | serverA | TCP      | ... 46954 → 25 [FIN, ACK] Seq=1033 Ack=628 Win=64128 Len=0 TSval=1811802948 TSecr=47598 |
| 354 | 92.614127 | serverA | serverB | TCP      | ... 25 → 46954 [ACK] Seq=628 Ack=1034 Win=64384 Len=0 TSval=475981777 TSecr=1811802948  |

-Lee가 메시지를 수신하는 과정

|     |            |                 |                 |     |                                                                                        |
|-----|------------|-----------------|-----------------|-----|----------------------------------------------------------------------------------------|
| 428 | 155.137395 | UbunClient(Lee) | serverA         | TCP | ... 42366 → 110 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM TSval=2714994759 TSecr= |
| 429 | 155.137504 | serverA         | UbunClient(Lee) | TCP | ... 110 → 42366 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM TSval=632967 |
| 430 | 155.137718 | UbunClient(Lee) | serverA         | TCP | ... 42366 → 110 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=2714994759 TSecr=632967989     |
| 431 | 155.141068 | serverA         | UbunClient(Lee) | POP | ... S: +OK Dovecot (Ubuntu) ready.                                                     |
| 432 | 155.141178 | UbunClient(Lee) | serverA         | TCP | ... 42366 → 110 [ACK] Seq=1 Ack=30 Win=64256 Len=0 TSval=2714994763 TSecr=632967993    |
| 433 | 155.141566 | UbunClient(Lee) | serverA         | POP | ... C: CAPA                                                                            |
| 434 | 155.141645 | serverA         | UbunClient(Lee) | TCP | ... 110 → 42366 [ACK] Seq=30 Ack=7 Win=65280 Len=0 TSval=632967993 TSecr=2714994763    |
| 435 | 155.141722 | serverA         | UbunClient(Lee) | POP | ... S: +OK                                                                             |
| 436 | 155.141801 | UbunClient(Lee) | serverA         | TCP | ... 42366 → 110 [ACK] Seq=7 Ack=119 Win=64256 Len=0 TSval=2714994764 TSecr=632967993   |
| 437 | 155.143177 | UbunClient(Lee) | serverA         | POP | ... C: USER lee                                                                        |
| 438 | 155.143236 | serverA         | UbunClient(Lee) | POP | ... S: +OK                                                                             |
| 439 | 155.143319 | UbunClient(Lee) | serverA         | POP | ... C: PASS lee                                                                        |
| 440 | 155.154838 | serverA         | UbunClient(Lee) | POP | ... S: +OK Logged in.                                                                  |
| 441 | 155.154921 | UbunClient(Lee) | serverA         | TCP | ... 42366 → 110 [ACK] Seq=27 Ack=140 Win=64256 Len=0 TSval=2714994777 TSecr=632968006  |
| 442 | 155.155036 | UbunClient(Lee) | serverA         | POP | ... C: CAPA                                                                            |
| 443 | 155.155534 | serverA         | UbunClient(Lee) | POP | ... S: +OK                                                                             |
| 444 | 155.155587 | UbunClient(Lee) | serverA         | TCP | ... 42366 → 110 [ACK] Seq=33 Ack=205 Win=64256 Len=0 TSval=2714994777 TSecr=632968007  |
| 445 | 155.155805 | UbunClient(Lee) | serverA         | POP | ... C: LIST                                                                            |
| 446 | 155.170021 | serverA         | UbunClient(Lee) | POP | ... S: +OK 1 messages:                                                                 |
| 447 | 155.170163 | UbunClient(Lee) | serverA         | POP | ... C: UIDL                                                                            |
| 448 | 155.170339 | serverA         | UbunClient(Lee) | POP | ... S: +OK                                                                             |
| 449 | 155.171007 | UbunClient(Lee) | serverA         | POP | ... C: RETR 1                                                                          |
| 450 | 155.171231 | serverA         | UbunClient(Lee) | POP | ... S: +OK 1159 octets                                                                 |
| 451 | 155.197385 | UbunClient(Lee) | serverA         | POP | ... C: DELE 1                                                                          |
| 452 | 155.197581 | serverA         | UbunClient(Lee) | POP | ... S: +OK Marked to be deleted.                                                       |
| 453 | 155.197769 | UbunClient(Lee) | serverA         | POP | ... C: QUIT                                                                            |
| 454 | 155.198241 | serverA         | UbunClient(Lee) | POP | ... S: +OK Logging out, messages deleted.                                              |
| 455 | 155.199100 | UbunClient(Lee) | serverA         | POP | ... C: QUIT                                                                            |



459번 : 메시지 확인

Frame 450: 1245 bytes on wire (9960 bits), 1245 bytes captured (9960 bits) on interf. Ethernet II, Src: serverA (00:0c:29:b5:3a:45), Dst: UbuClient(Lee) (00:0c:29:c3:bc: Internet Protocol Version 4, Src: serverA (192.168.111.100), Dst: UbuClient(Lee) (1 Transmission Control Protocol, Src Port: 110, Dst Port: 42366, Seq: 261, Ack: 53, Len Post Office Protocol

```

+OK 1159 octets\r\n
  Response indicator: +OK
  Response description: 1159 octets
Return-Path: <kim@daum.net>\r\n
Received: from mail.daum.net ([192.168.111.200])\r\n
\tby mail.naver.com (8.15.2/8.15.2/Debian-18) with ESMTP id 43Q1wwYr007507\r\n
\tfor <lee@naver.com>; Fri, 26 Apr 2024 10:58:59 +0900\r\n
Received: from desktop-oeju5p7.localdomain ([192.168.111.133])\r\n
\tby mail.daum.net (8.15.2/8.15.2/Debian-18) with ESMTP id 43Q1wvqQ007664\r\n
\tfor <lee@naver.com>; Fri, 26 Apr 2024 01:58:58 GMT\r\n
Content-Type: text/plain; charset=euc-kr; format=flowed; delp=yes\r\n
To: =?euc-kr?B?wMyz18DMufY=?<lee@naver.com>\r\n
Subject: Re: test2\r\n
References: <a84b8cfb564e117b3628faa74fa40a4fb695bbeef.camel@naver.com>\r\n
Date: Fri, 26 Apr 2024 10:58:52 +0900\r\n
MIME-Version: 1.0\r\n
From: =?euc-kr?B?sei02cC9=?<kim@daum.net>\r\n
Message-ID: <op.2mtbsekxnak22s@desktop-oeju5p7.localdomain>\r\n
In-Reply-To: <a84b8cfb564e117b3628faa74fa40a4fb695bbeef.camel@naver.com>\r\n
User-Agent: Opera Mail/1.0 (Win32)\r\n
Content-Transfer-Encoding: 8bit\r\n
X-MIME-Autoconverted: from Base64 to 8bit by mail.naver.com id 43Q1wwYr007507\r\n
\r\n
\r\n
■ Kim ■ Lee ■■■■■ ■■■■■ ■\u007BD■■■■70. Reply\r\n
\r\n
\r\n
Fri, 26 Apr 2024 10:57:59 +0900, ■■■■ <lee@naver.com>■■■■ ■ ■■:\r\n
\r\n
> Lee ■ Kim ■■■■■ ■■■■■ ■\u007BD■■■■ 0 ■■ ■j\r\n
.\r\n

```

**From:** 김다음 <[kim@daum.net](mailto:kim@daum.net)>  
**To:** 이네이버 <[lee@naver.com](mailto:lee@naver.com)>  
**Subject:** Re: test2  
**Date:** Fri, 26 Apr 2024 10:58:52 +0900

이건 Kim이 Lee에게 보내는 메시지입니다. Reply

Fri, 26 Apr 2024 10:57:59 +0900, 이네이버 <[lee@naver.com](mailto:lee@naver.com)>님이 쓴 글:

> Lee가 Kim에게 보내는 메시지 확인 바람

이메일은 잘 받았지만 wireshark에서 한국어를 제대로 표시하지 못하는 상황입니다.