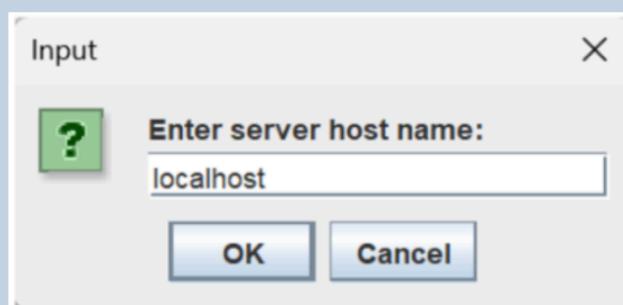
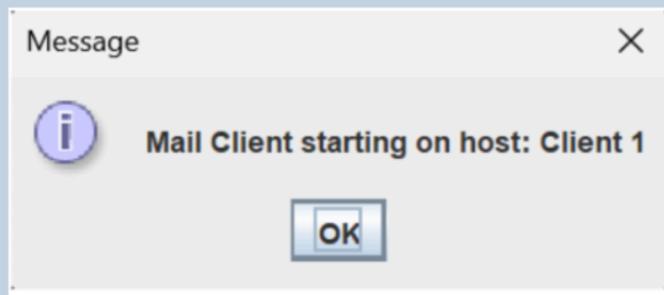
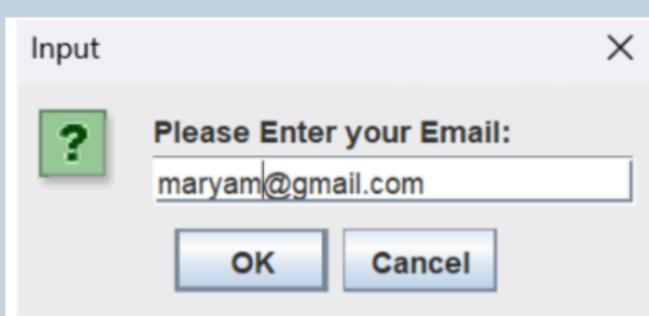
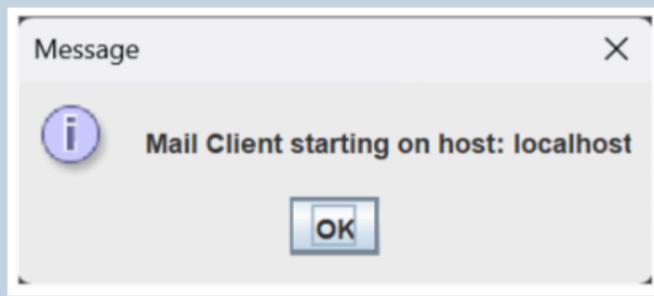


Client Logging in - Sender



Client Logging in - Reciever



Three Way Handshake - Retransmission

```
Console X  
Client1_Jframe (1) [Java Application] C:\Users\Sahlah Baby\Documents  
[SYN sent to server. Waiting for ACK...]
```

Client sends SYN to an Unactive Server, Waiting for Ack

After 5 seconds

```
Console X  
Client1_Jframe (1) [Java Application] C:\Users\Sahlah Baby\Documents\MY S  
[SYN sent to server. Waiting for ACK...  
Timeout waiting for ACK. Resending SYN...  
SYN sent to server. Waiting for ACK...]
```

SYN timeouts and Client Retransmits

After some more time

```
Console X  
Client1_Jframe (1) [Java Application] C:\Users\Sahlah Baby\Documents  
[SYN sent to server. Waiting for ACK...  
Timeout waiting for ACK. Resending SYN...  
SYN sent to server. Waiting for ACK...  
Timeout waiting for ACK. Resending SYN...  
SYN sent to server. Waiting for ACK...  
Timeout waiting for ACK. Resending SYN...  
SYN sent to server. Waiting for ACK...  
Timeout waiting for ACK. Resending SYN...  
SYN sent to server. Waiting for ACK...]
```

Retransmission Continues

Successful Three Way Handshake

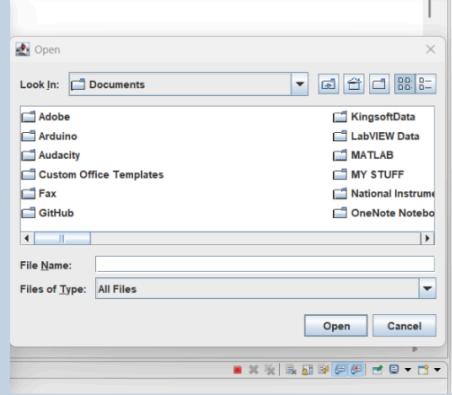
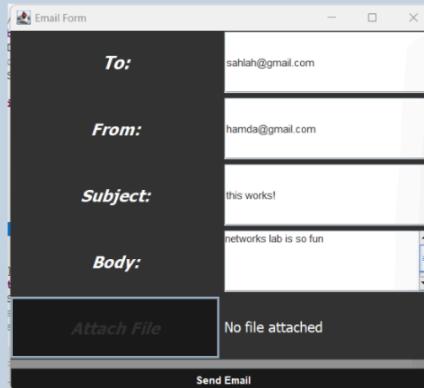
```
Console X  
server1 (1) [Java Application] C:\Users\Sahlah Baby\Documents\MY STUFF\APP  
Received SYN from client at /127.0.0.1:52655  
Sent ACK to client.  
Received ACK ACK from client. Handshake complete.
```

Client Console

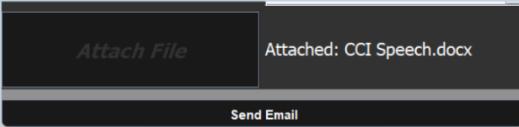
```
Console X  
Client1_Jframe (1) [Java Application] C:\Users\Sahlah Baby\Documents\MY STU  
[SYN sent to server. Waiting for ACK...  
ACK received from server.  
ACK ACK sent to server. Handshake complete.]
```

Server Console

Sending Attachments



User Get an Option to add an Attachment using the interactive UI



```

ACK-AKA-SENT-TO-SERVER. handshake complete.
File path: C:\Users\Sahlah Baby\Documents\CCI Speech.docx
File size in Bytes: 17263 bytes
File size in KB: 16.86 KB
File size in MB: 0.02 MB
  
```

Once File is Attached, It is ready to be broken down into chunks

```
[0, 0, 80, 75, 3, 4, 20, 0, 6, 0, 8, 0, 0, 0, 33, 0, -33, -92, -46, 108, 90, 1, 0, 0, 32, 5, 0, 0, 19, 0, 8, 2, 91, 67, 111, 110, 116, 101, 110, 116, 95, 84
[0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
[0, 2, -87, 34, -82, -23, -85, -102, -33, 69, 92, 61, 102, -55, 43, 34, -100, 112, 29, 76, -125, 48, -48, 43, -94, -23, -76, 11, 50, 60, -120, 31, -49, -104
[0, 3, 1, 14, 95, 80, -64, 6, -9, -120, -17, 105, 54, -43, -76, 82, 18, 103, 114, 27, 60, -10, 4, -124, -102, 108, 72, 64, 65, 92, -64, 67, -77, -3, 116, 10
[0, 4, -101, -27, 29, 89, 123, -75, 56, 123, 50, 105, -72, -61, 38, -102, 39, -54, 21, -111, -31, -64, -103, 76, 74, 110, -4, -64, -82, -105, 116, -83, -60,
[0, 5, 13, 119, 123, -83, 86, 123, -40, -35, 46, 121, 127, 23, 27, 14, -80, -13, -98, -36, 50, -127, 14, -1, 29, -97, -117, -127, 18, -4, -47, -80, 77, 63,
[0, 6, -90, 83, 21, 113, 57, 116, 29, 76, 51, -14, 101, -94, 32, -2, -110, 49, -59, -31, 73, 55, -81, 109, 16, 35, 25, -21, -35, -41, 52, -67, 120, -24, 18,
[0, 7, -126, -91, 38, -121, 114, -13, 113, -21, -67, -96, 28, -18, 106, -106, -123, 12, 124, -59, 113, 83, -120, 33, 103, -66, -15, -127, 120, 52, 66, -3, 9
[0, 8, 118, 14, -108, 74, 119, 103, -91, 124, 64, -31, 95, 34, -123, 26, 24, 81, -66, -81, 84, 99, 67, 66, 99, -57, -45, -86, -6, 18, 11, 17, 80, -18, 28, 3
[0, 9, -12, -50, 78, -123, 69, -37, -62, -94, -91, -44, 23, -78, -48, 95, 75, -81, -64, -27, -28, 32, -11, 72, -36, -9, 82, 70, 16, 110, 16, -46, 99, -27, -
[0, 10, -33, -19, -31, -14, -128, 57, 46, 37, -31, -37, 14, -105, -64, -74, 97, -83, -28, -84, 54, 122, 21, -5, -125, -55, 13, -76, 29, 14, -73, 98, -80, -4
[0, 11, 28, 22, -15, -126, -89, -84, 120, -85, -106, 60, -50, 84, -98, -78, 82, -65, -52, -25, -61, -108, -27, 15, -85, -27, -101, 88, -91, 75, 86
[0, 12, -2, -74, 122, -103, -107, 72, -69, 87, 35, 9, 122, 41, 85, -4, 64, -109, -122, -81, -97, -105, 60, -41, 101, -39, 67, 111, -46, 103, 37, -91, 122, -
[0, 13, -37, 69, 29, 117, 71, -83, 123, -27, 103, 117, 127, 22, -31, 82, -87, -121, -88, -15, -63, -61, 35, 91, 111, 116, -125, -120, -87, 20, -54, -98, -94
[0, 14, -87, -23, -88, 53, -41, 104, 13, -122, -94, 14, -88, -127, -120, -21, 113, -10, -57, 115, -54, -8, 19, 51, -70, -69, -128, -100, -47, 1, 9, -53, 56,
[0, 15, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -116, -110, -33, 79, -61, 32, 16, -128, -33, 77, -4, 31, 26, -34, 59, -38, 46, -45, -39, 116, 53,
[0, 16, -37, 1, 15, 40, -6, -39, 110, -123, -22, 21, 30, -29, -6, -120, 50, 90, -97, 5, -11, -109, -90, 59, -49, -77, -17, 34, 96, -33, -75, 42, 63, 10, -81
[0, 17, 67, 67, 73, 32, 83, 112, 101, 101, 99, 104, 46, 100, 111, 99, 120]
```

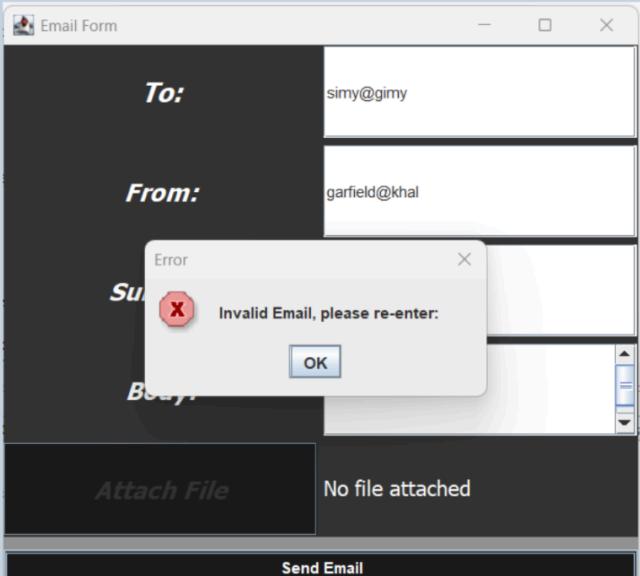
```

Cumulative Ack of all packets, Seq No= 0
Cumulative Ack of all packets, Seq No= 1
Cumulative Ack of all packets, Seq No= 2
Cumulative Ack of all packets, Seq No= 3
Cumulative Ack of all packets, Seq No= 4
Cumulative Ack of all packets, Seq No= 5
Cumulative Ack of all packets, Seq No= 6
Cumulative Ack of all packets, Seq No= 7
Cumulative Ack of all packets, Seq No= 8
Cumulative Ack of all packets, Seq No= 9
Cumulative Ack of all packets, Seq No= 10
Cumulative Ack of all packets, Seq No= 11
Cumulative Ack of all packets, Seq No= 12
Cumulative Ack of all packets, Seq No= 13
Cumulative Ack of all packets, Seq No= 14
Cumulative Ack of all packets, Seq No= 15
Cumulative Ack of all packets, Seq No= 16
Cumulative Ack of all packets, Seq No= 17
No missing packets

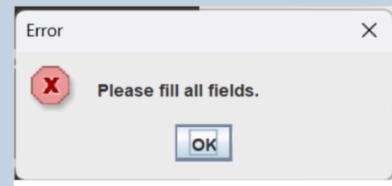
last seq number: 17
  
```

File is converted to bytes and divided into packets. Sever then get sent the cumulative ack of each packet, and not of each individual byte. Lastly the last sequence number is used to send Cumulative ACK.

Email Verification

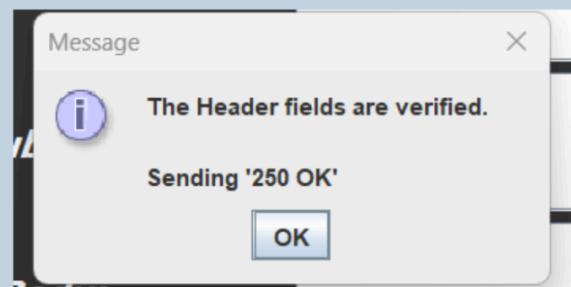


If the Email is not in the file, client gets an Invalid Email Alert.
Sample of another error message below



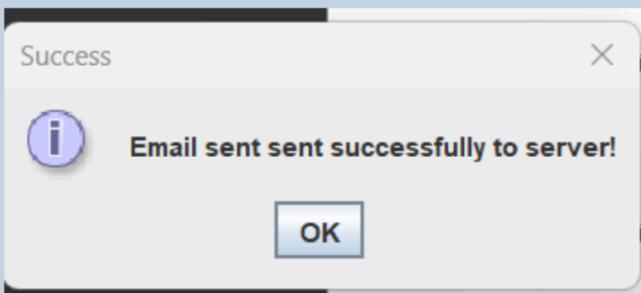
```
mapping.txt x
1 email_address,host_name
2 maryam@gmail.com,localhost
3 maryam.004@gmail.com,mail.gmail.com
4 maryam.alsabaaa@gmail.com,mail.gmail.com
5 sahlah@yahoo.com,localhost
6 shamsa@gmail.com,localhost
7 hamda@gmail.com,localhost
8 khailid@gmail.com, client 2
9 saleh@gmail.com, receiver1
10 sahlah@gmail.com, localhost
```

The mapping file is used to confirm host and client email.

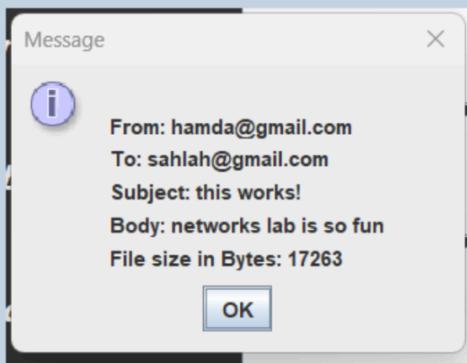
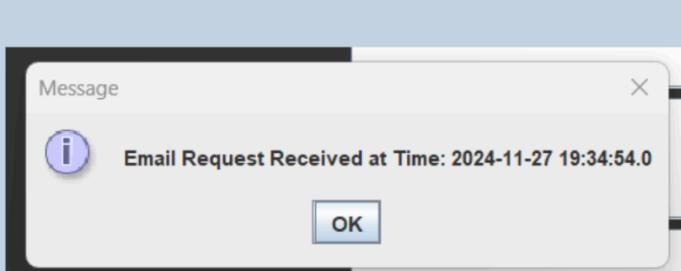


250 is sent once all header fields are verified.

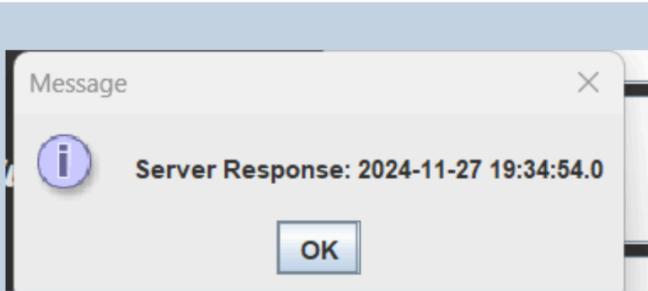
Email Request from Client



Once client correctly fills all the fields, they get a JOptionPane notifying them that their email was sent to server!



Server Receives Request, and sends ACK to Client that He Has Received

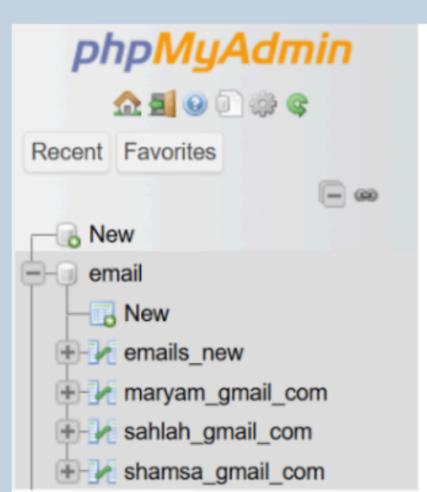


Client gets ACK from Server with Timestamp

Client Directories at Server

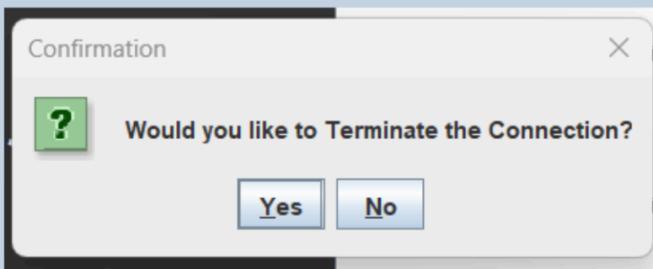
send_to	send_from	subject	body	timestamp	file	file_name
maryaam.004@gmail.com	maryaam.004@gmail.com	Network	hello	2024-11-23 02:40:31	[BLOB - 173 B]	Fall 23.url
maryaam.004@gmail.com	maryaam.004@gmail.com	networks	maryam is here	2024-11-23 02:40:31	[BLOB - 64.0 KiB]	ID.txt
maryaam.004@gmail.com	maryaam.004@gmail.com	networks	maryam is here	2024-11-23 02:40:31	[BLOB - 64.0 KiB]	ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-24 17:46:58	[BLOB - 64.0 KiB]	2024-11-24_17-46-58_ID.txt
maryam@gmail.com	shamsa@gmail.com	ff	f	2024-11-24 17:53:52	[BLOB - 64.0 KiB]	2024-11-24_17-53-52_ID.txt
maryam@gmail.com	shamsa@gmail.com	e	e	2024-11-24 18:03:09	[BLOB - 64.0 KiB]	2024-11-24_18-03-08_ID.txt
maryam@gmail.com	shamsa@gmail.com	r	r	2024-11-24 18:05:12	[BLOB - 64.0 KiB]	2024-11-24_18-05-12_ID.txt
maryam@gmail.com	shamsa@gmail.com	f	f	2024-11-24 18:20:13	[BLOB - 64.0 KiB]	2024-11-24_18-20-13_ID.txt
maryam@gmail.com	shamsa@gmail.com	f	f	2024-11-24 18:25:08	[BLOB - 64.0 KiB]	2024-11-24_18-25-08_ID.txt
maryam@gmail.com	shamsa@gmail.com	f	f	2024-11-24 18:27:37	[BLOB - 64.0 KiB]	2024-11-24_18-27-37_ID.txt
maryam@gmail.com	shamsa@gmail.com	f	f	2024-11-24 18:32:48	[BLOB - 64.0 KiB]	2024-11-24_18-32-48_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-24 18:34:40	[BLOB - 64.0 KiB]	2024-11-24_18-34-40_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-24 18:40:57	[BLOB - 64.0 KiB]	2024-11-24_18-40-57_ID.txt
maryam@gmail.com	sahlah@gmail.com	w	w	2024-11-24 18:44:14	[BLOB - 64.0 KiB]	2024-11-24_18-44-14_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-24 18:50:55	[BLOB - 64.0 KiB]	2024-11-24_18-50-55_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-24 18:54:02	[BLOB - 64.0 KiB]	2024-11-24_18-54-02_ID.txt
maryam@gmail.com	shamsa@gmail.com	ee	ee	2024-11-25 17:43:52	[BLOB - 64.0 KiB]	2024-11-25_17-43-52_ID.txt
maryam@gmail.com	shamsa@gmail.com	ss	ss	2024-11-25 17:47:58	[BLOB - 64.0 KiB]	2024-11-25_17-47-58_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-25 17:52:35	[BLOB - 64.0 KiB]	2024-11-25_17-52-35_ID.txt
maryam@gmail.com	shamsa@gmail.com	w	w	2024-11-25 17:53:32	[BLOB - 64.0 KiB]	2024-11-25_17-53-32_ID.txt
maryam@gmail.com	shamsa@gmail.com	e	e	2024-11-25 17:58:53	[BLOB - 64.0 KiB]	2024-11-25_17-58-53_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-25 17:59:45	[BLOB - 64.0 KiB]	2024-11-25_17-59-45_ID.txt
maryam@gmail.com	shamsa@gmail.com	d	d	2024-11-25 18:23:55	[BLOB - 64.0 KiB]	2024-11-25_18-23-55_ID.txt

Directories are created at server database
everytime a client sends an email. Above you can
see the many trials of email we sent.



Additionally, Each Client also has thier own
directory once they connect to the Server.

Termination Sequence



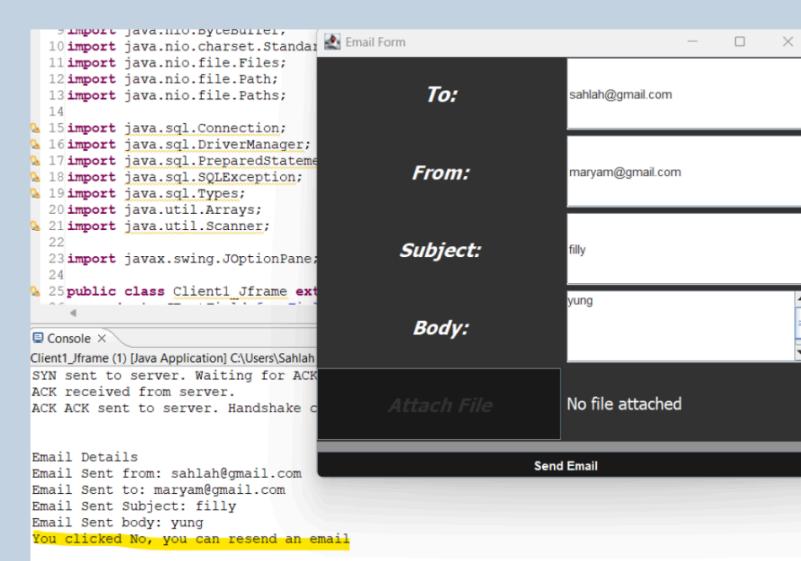
After sending an Email, Sender Client is asked if they would like to terminate

You clicked Yes.
Received ACK from Server, Sending ACK- ACK
Sent ACK ACK to server.

If Yes, FIN is sent to server, and they wait for ACK from Server

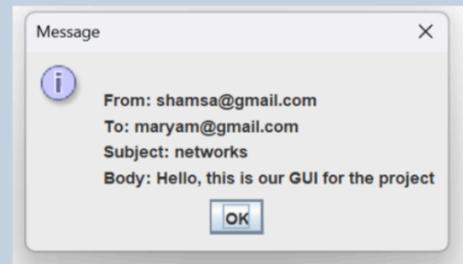
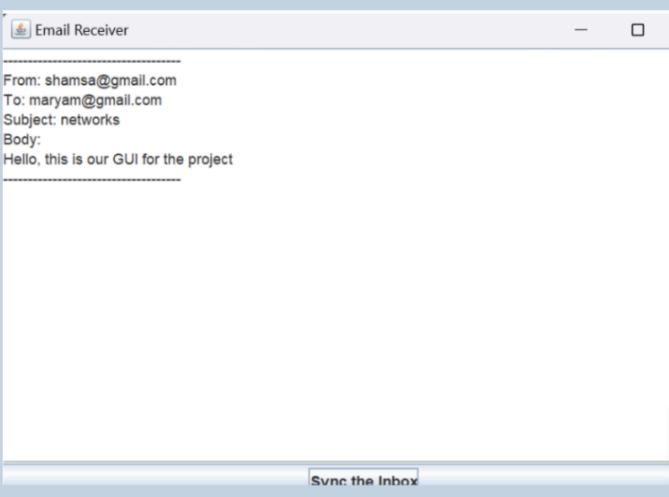
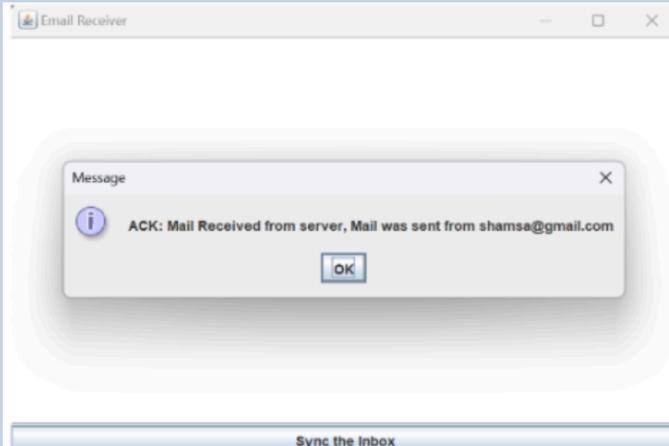
Received FIN from client at /127.0.0.1:56274
Received ACK ACK from client. Termination complete.

Server receives FIN, sends ACK and waits for ACK-ACK

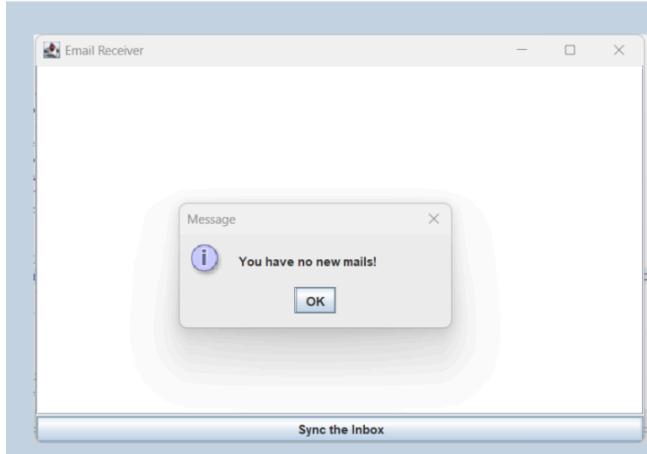


If Client does not choose to terminate, they get an option to continue resending an email.

Reciever Client



**Once Client
Connects, and they
Click Sync the Inbox,
they receive the
email they were sent
from the client.**



**If they have no new
emails, they get a
notification instead.**