

Mail User Agent Project

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Introduction

(From Kurose & Ross, 4th ed.) In this project you will implement a mail user agent (MUA) that sends mail to other users. Your task is to program the SMTP interaction between the MUA and the local SMTP server. The client provides a graphical user interface containing fields for entering the recipient addresses, the subject of the message and the message itself. Here's what the user interface looks like:



With this interface, when you want to send a mail, you must fill in complete addresses for the recipients, i.e., `tk@goucher.edu`, not just simply `tk`. You can send mail to multiple `To`, `CC`, and `BCC` recipients. The hostname of the local SMTP server will be given on the command line. When you have finished composing your mail, press `Send` to send it.

The Code

The program consists of four classes:

1. `MailClient` — The user interface.
2. `Message` — Mail message.
3. `Envelope` — SMTP envelope around the `Message`.

4. SMTPConnection — Connection to the SMTP server.

You will need to complete the code in the `SMTPConnection` class so that in the end you will have a program that is capable of sending mail to any recipient. The code for the `SMTPConnection` class is at the end of this description. The code for the other three classes is provided on the class web site.

The places where you need to complete the code have been marked with the comments

```
/* Fill in */
```

Each of the places requires one or more lines of code.

The `MailClient` class provides the user interface and calls the other classes as needed. When you press Send, the `MailClient` class constructs a `Message` class object to hold the mail message. The `Message` object holds the actual message headers and body. Then the `MailClient` object builds the SMTP envelope using the `Envelope` class. This class holds the SMTP sender and recipient information, the SMTP server of the recipient's domain, and the `Message` object. Then the `MailClient` object creates the `SMTPConnection` object which opens a connection to the SMTP server and the `MailClient` object sends the message over the connection. The sending of the mail happens in three phases:

1. The `MailClient` object creates the `SMTPConnection` object and opens the connection to the SMTP server.
2. The `MailClient` object sends the message using the function `SMTPConnection.send()`.
3. The `MailClient` object closes the SMTP connection.

The `Message` class contains the function `isValid()` which is used to check the addresses of the sender and recipient to make sure that there is only one address and that the address contains the @-sign. The provided code does not do any other error checking.

Reply Codes

For the basic interaction of sending one message, you will only need to implement a part of SMTP. In this project you need only to implement the following SMTP commands:

Command	Reply Code
DATA	354
HELO	250
MAIL FROM	250
QUIT	221
RCPT TO	250

The above table also lists the accepted reply codes for each of the SMTP commands you need to implement. For simplicity, you can assume that any other reply from the server indicates a fatal error and abort the sending of the message. In reality, SMTP distinguishes between transient (reply codes 4xx) and permanent (reply codes 5xx) errors, and the sender is allowed to repeat commands that yielded in a transient error. See Section 4.2.1 of RFC 5321 for more details.

In addition, when you open a connection to the server, it will reply with the code 220.

Note: RFC 5321 allows the code 251 as a response to a `RCPT TO`-command to indicate that the recipient is not a local user. You may want to verify manually with the telnet command what your local SMTP server replies.

Hints

Most of the code you will need to fill in is similar to the code you wrote in the WebServer project. You may want to use the code you have written there to help you.

To make it easier to debug your program, do not, at first, include the code that opens the socket, but use the following definitions for `fromServer` and `toServer`. This way, your program sends the commands to the terminal. Acting as the SMTP server, you will need to give the correct reply codes. When your program works, add the code to open the socket to the server.

```
fromServer = new BufferedReader(new InputStreamReader(System.in));
toServer = System.out;
```

The lines for opening and closing the socket, i.e., the lines

```
connection = ...
```

in the constructor and the line `connection.close()` in function `close()`, have been commented out by default.

Start by completing the function `parseReply()`. You will need this function in many places. In the function `parseReply()`, you should use the `StringTokenizer` class for parsing the reply strings. You can convert a string to an integer as follows:

```
int i = Integer.parseInt(argv[0]);
```

In the function `sendCommand()`, you should use the function `writeBytes()` to write the commands to the server. The advantage of using `writeBytes()` instead of `write()` is that the former automatically converts the strings to bytes which is what the server expects. Do not forget to terminate each command with the string `CRLF`.

You can throw exceptions like this:

```
throw new Exception();
```

You do not need to worry about details, since the exceptions in this project are only used to signal an error, not to give detailed information about what went wrong.

For these parts of the project, you will need to modify the classes from what is given here.

1. Construct sender address. Java's `System` class contains information about the username and the `InetAddress` class contains methods for finding the name of the local host. Use these to construct the sender address for the `Envelope`.
2. Multiple recipients. Your program should be able to handle an arbitrary number of `To`, `CC`, and `BCC` recipients.

SMTPConnection.java

This is the code for the `SMTPConnection` class that you will need to complete. The code for the other three classes is provided on the class web site.

```
import java.net.*;
import java.io.*;
import java.util.*;

/**
```

```

* Open an SMTP connection to a mailserver and send one mail.
*
*/
public class SMTPConnection {
    /* The socket to the server */
    private Socket connection;

    /* The mail envelope */
    private Envelope envelope;

    /* Streams for reading and writing the socket */
    private BufferedReader fromServer;
    private DataOutputStream toServer;

    private static final int SMTP_PORT = 25;
    private static final String CRLF = "\r\n";

    /* Are we connected? Used in close() to determine what to do. */
    private boolean isConnected = false;

    /* Create an SMTPConnection object. Create the socket and the
       associated streams. Initialize SMTP connection. */
    public SMTPConnection(Envelope envelope) throws IOException {
        // connection = /* Fill in */;
        fromServer = /* Fill in */;
        toServer = /* Fill in */;

        /* Fill in */
        /* Read a line from server and check that the reply code is 220.
           If not, throw an IOException. */
        /* Fill in */

        /* SMTP handshake. We need the name of the local machine.
           Send the appropriate SMTP handshake command. */
        String localhost = /* Fill in */;
        sendCommand( /* Fill in */ );

        isConnected = true;
    }

    /* Send the message. Write the correct SMTP-commands in the
       correct order. No checking for errors, just throw them to the
       caller. */
    public void send() throws IOException {
        /* Fill in */
        /* Send all the necessary commands to send a message. Call
           sendCommand() to do the dirty work. Do not catch the
           exception thrown from sendCommand(). The body headers are separated

```

```

        from the body text by exactly one empty line. */
/* Fill in */
    }

    /* Close the connection. First, terminate on SMTP level, then
       close the socket. */
    public void close() {
isConnected = false;
try {
    sendCommand( /* Fill in */ );
    // connection.close();
} catch (IOException e) {
    System.out.println("Unable to close connection: " + e);
    isConnected = true;
}
}

    /* Send an SMTP command to the server. Check that the reply code is
       what is supposed to be according to RFC 5321. */
    private void sendCommand(String command, int rc) throws IOException {
/* Fill in */
/* Write command to server and read reply from server. */
/* Fill in */

/* Fill in */
/* Check that the server's reply code is the same as the parameter
   rc. If not, throw an IOException. */
/* Fill in */
    }

    /* Parse the reply line from the server. Returns the reply code. */
    private int parseReply(String reply) {
/* Fill in */
    }

    /* Destructor. Closes the connection if something bad happens. */
    protected void finalize() throws Throwable {
if(isConnected) {
    close();
}
super.finalize();
}
}
}

```

Administrivia

1. Your main Java class should be named `MailClient`. Ensure that the following will successfully start your client:

```
java MailClient <smtp_server>
```

using `smtp_server` as the local SMTP server. For example:

```
java MailClient phoenix.goucher.edu
```

2. If you want to write your web server in a language other than Java, check with me FIRST
3. Your source code must be appropriately documented. This will count as 50% of your grade. Spelling and grammar matter. See <http://www.horstmann.com/bigj2/style.html> for a reasonable Java style guide.
4. Your client code must be emailed **as an attachment** to `kelliher[at]goucher.edu` by the beginning of class on the due date.
5. Your client code will be tested by running it on merlin, using phoenix, bluebird, and goldfinch as SMTP servers. Phoenix will accept mail from your client. Note that bluebird prohibits relaying and goldfinch doesn't allow TCP connections to the SMTP port. Your code should be capable of printing a diagnostic error message in these situations in a non-hostname dependent manner.
6. There are many mail clients available in source form out on the web. I consider merely viewing any such source code, regardless of implementation language, to be a violation of the Honor Code. In a similar vein, although I encourage you to discuss concepts with each other, I prohibit you from sharing any code with each other. Again, any violation of this policy is a violation of the Honor Code.