Assignment 6:
Application Layer Protocols: SMTP, FTP

- This assignment will be introduced in a class meeting on November 29th, 2016 at 11:30 in seminar room 0.124.
- The groups will present the solution of this assignment on December 6th, 2016 at 11:30. We will meet in seminar room 0.124.
- You may work on the assignments in groups of up to three people (if possible, keep the same groups as in the previous assignments).
- All members of a group have to show up together for the grading of the assignment. For the grading, each group will need to have the source code ready for the discussion as well as the running implementation to be presented by the group. Moreover, each group member might be asked questions about the solution.
- If you have questions, send an email to adnan.tariq@ipvs.uni-stuttgart.de.

Task 1 – SMTP and MIME

Task 1.1 – SMTP and Quoted Printable Encoding

Assume you want to send an e-mail with the following information:

- *Recipient:* adnan.tariq@ipvs.uni-stuttgart.de
- *Sender:* Your e-mail address
- *Subject:* Net-based Applications Exercise
- *Content:*
  Hello Mr. Adnan,
  do you know how the Umlaut “ä” and the letter “ß” are encoded using quoted-printable encoding?

Describe the format of this e-mail as transmitted using SMTP including the SMTP envelop, the header and body of this e-mail. For encoding the special characters of the body, use the quoted-printable encoding and the ISO 8859-1 character set.

Task 1.2 – Multi-part E-Mails

Assume that you want to attach a PDF file to the email of Task 1.1 (additionally to the plain text message body). How does MIME support such multi-part e-mails? Describe the format of this e-mail including the necessary header fields, text body, and PDF attachment (it is sufficient to include only the first bytes of the attachment). Choose a suitable encoding for the PDF attachment.

Task 1.3 – Base64 Encoding

Assume you have received an E-Mail with the following header and body (some header fields have been left out):

```
Subject: Base64 Test
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: base64

3GJ1bmcgbWFjaHQgZGVuIE1laXN0ZXI=
```

Decode the body of the message.

Explain in detail how to decode a base64-encoded message using the first 4 characters of the given mail body as example.

Task 2 – FTP

Task 2.1

In this task, you manually emulate the FTP protocol to download a file from an FTP server.

To receive a file via the data connection to an FTP server, a receiver process is listening on a given port on the client machine. When the FTP server opens a data connection to the client (active mode), the receiver will receive the file content via a TCP socket and store it on the local hard disk with the file name `download-<number>` (the number will be increased after each download). The implementation of this receiver is provided in the directory `/home/tariqan/assignment6/` on `netappsvm.informatik.uni-stuttgart.de`. You can start a receiver on a given port (for instance port 5000) with the following command:

```
java -cp Receiver.jar Receiver 5000
```

It is your task to emulate the FTP commands send over the control connection to the FTP server to start the file download. Use the Telnet client to open a control connection to the FTP server on *netappsvm* on port 21 (21 is the well-known control port number of an FTP server):

```
telnet netappsvm.informatik.uni-stuttgart.de 21
```

Then you can use this control connection to manually send commands to the server according to the FTP protocol (see RFC 959 for a detailed description of the necessary commands).

Describe the FTP commands to download a binary file (e.g., an image) from the FTP server using your user name and password (same password as the login password).

Note: You can run the receiver process and the telnet command on the *netappsvm* server. That is, log in to *netappsvm* and run the above commands. This avoids any connection problems due to firewalls.

Task 2.2

What has to be changed to use the *passive* transfer mode? Describe the protocol interaction including the necessary FTP commands.

Further Information and Recommended Reading

- The ISO 8859-1 code can be found at
  http://en.wikipedia.org/wiki/ISO/IEC_8859-1
- The Base64 code can be found at
  http://tools.ietf.org/html/rfc1521#section-5.2
- FTP specification (RFC 959):
  http://tools.ietf.org/html/rfc959