Security Test Plan & Credentials

1.Test Credentials

The following test accounts are used to demonstrate authentication, authorization, and access control within the system:

Table 1: credentials showing usernames, roles, and access privilege

username	password	Role	Description
admin	adminpass	Super	Administrator with full privileges
User1	Pass1	Normal	Standard user with limited privileges

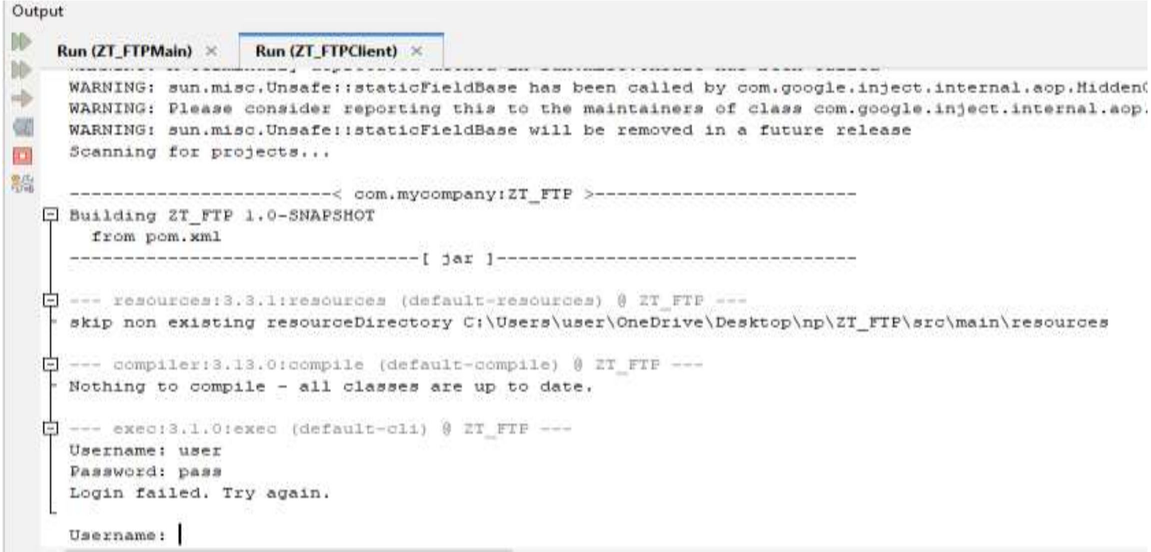
User credentials are stored in the users.txt file in the format:
username:password:role

2. Security Feature Tests

2.1 Failed Authentication Test

Steps:

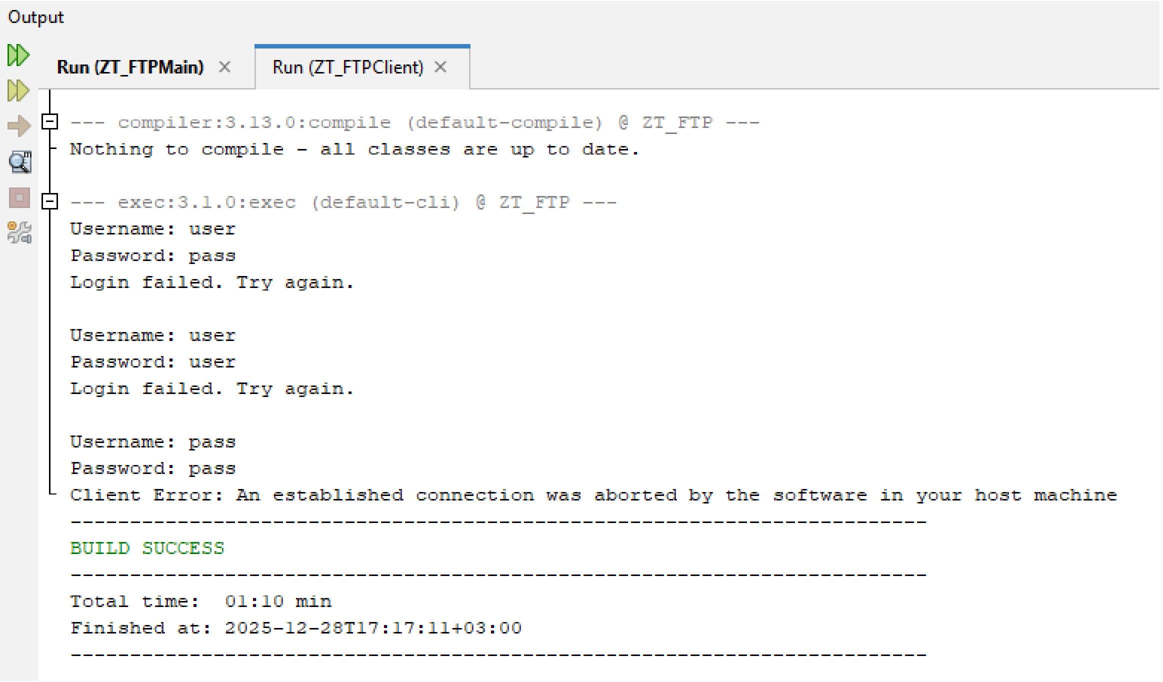
1. Run the client.
2. Enter an invalid username or password (e.g., user1 / wrongpass).
3. Repeat the failed login attempt multiple times.



```
WARNING: sun.misc.Unsafe::staticFieldBase has been called by com.google.inject.internal.aop.Hidden(
WARNING: Please consider reporting this to the maintainers of class com.google.inject.internal.aop.
WARNING: sun.misc.Unsafe::staticFieldBase will be removed in a future release
Scanning for projects...

------------------------< com.mycompany:ZT_FTP >------------------------
Building ZT_FTP 1.0-SNAPSHOT
  from pom.xml
--------------------------------[ jar ]---------------------------------

--- resources:3.3.1:resources (default-resources) @ ZT_FTP ---
skip non existing resourceDirectory C:\Users\user\OneDrive\Desktop\np\ZT_FTP\src\main\resources

--- compiler:3.13.0:compile (default-compile) @ ZT_FTP ---
Nothing to compile - all classes are up to date.

--- exec:3.1.0:exec (default-cli) @ ZT_FTP ---
Username: user
Password: pass
Login failed. Try again.

Username: 
```

Figure 1: Output of the failed authentication test showing unsuccessful login attempts

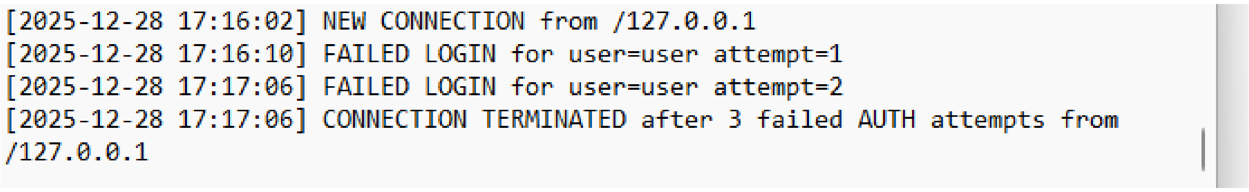
The server responds with an authentication failure message.



```
--- compiler:3.13.0:compile (default-compile) @ ZT_FTP ---
Nothing to compile - all classes are up to date.

--- exec:3.1.0:exec (default-cli) @ ZT_FTP ---
Username: user
Password: pass
Login failed. Try again.

Username: user
Password: user
Login failed. Try again.

Username: pass
Password: pass
Client Error: An established connection was aborted by the software in your host machine
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  01:10 min
Finished at: 2025-12-28T17:17:11+03:00
------------------------------------------------------------------------
```

Figure 2: Authentication failure messages displayed after invalid login attempts

After exceeding the allowed number of attempts, the server terminates the connection.



```
[2025-12-28 17:16:02] NEW CONNECTION from /127.0.0.1
[2025-12-28 17:16:10] FAILED LOGIN for user=user attempt=1
[2025-12-28 17:17:06] FAILED LOGIN for user=user attempt=2
[2025-12-28 17:17:06] CONNECTION TERMINATED after 3 failed AUTH attempts from
/127.0.0.1
```

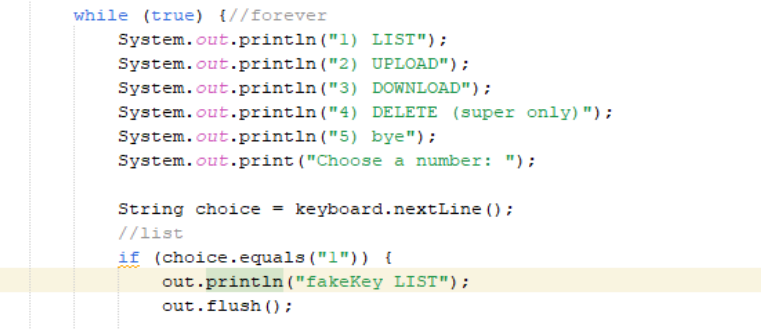
Figure 3: Logged failed login attempts and automatic connection termination

The event is logged in logs/server.log

2.2 Session Key Enforcement Test

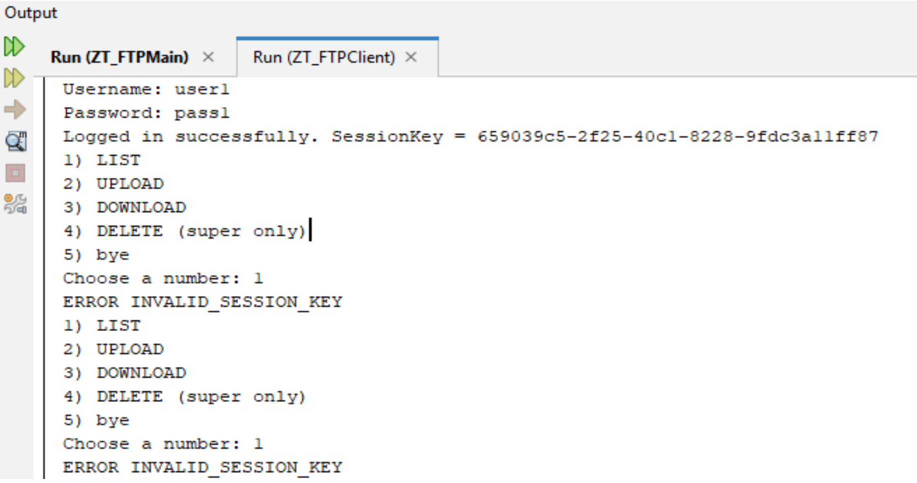
Steps:

1. Log in successfully to obtain a valid session key.
2. Modify a command or attempt to send a command with an invalid or missing session key.
3. Repeat the invalid command multiple times



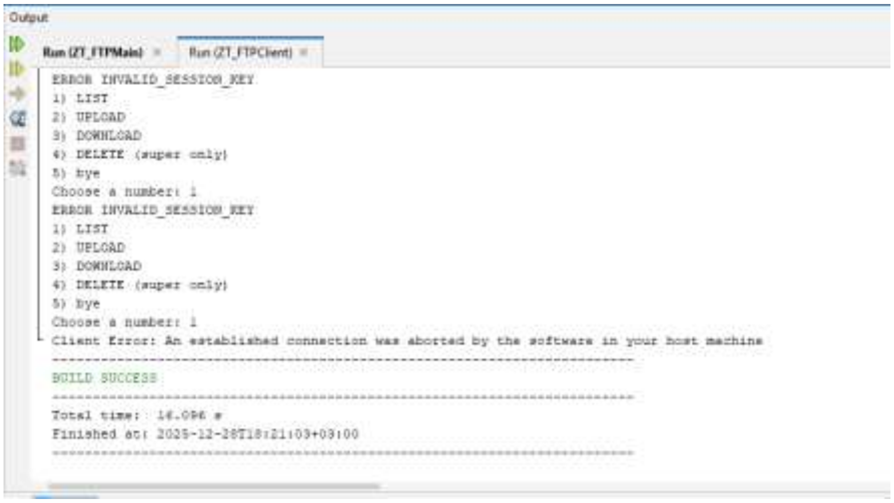
```
while (true) {//forever
    System.out.println("1) LIST");
    System.out.println("2) UPLOAD");
    System.out.println("3) DOWNLOAD");
    System.out.println("4) DELETE (super only)");
    System.out.println("5) bye");
    System.out.print("Choose a number: ");

    String choice = keyboard.nextLine();
    //list
    if (choice.equals("1")) {
        out.println("fakeKey LIST");
        out.flush();
```

Figure 4: Client-side code generating commands with an invalid session key for testing purposes



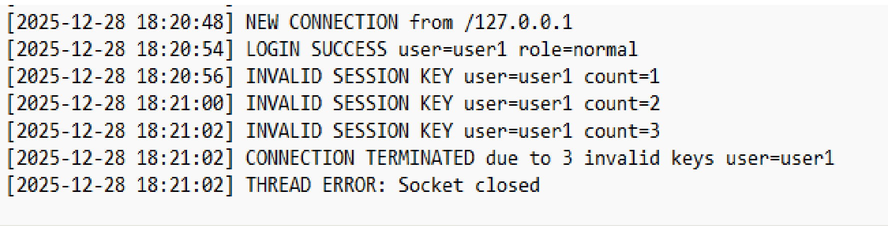
```
Username: user1
Password: pass1
Logged in successfully. SessionKey = 659039c5-2f25-40c1-8228-9fdc3a11ff87
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 1
ERROR INVALID_SESSION_KEY
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 1
ERROR INVALID_SESSION_KEY
```

Figure 5: System response when executing commands with an invalid session key



```
ERROR INVALID_SESSION_KEY
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 1
ERROR INVALID_SESSION_KEY
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 1
Client Error: An established connection was aborted by the software in your host machine
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  16.096 s
Finished at: 2025-12-28T18:21:03+03:00
------------------------------------------------------------------------
```

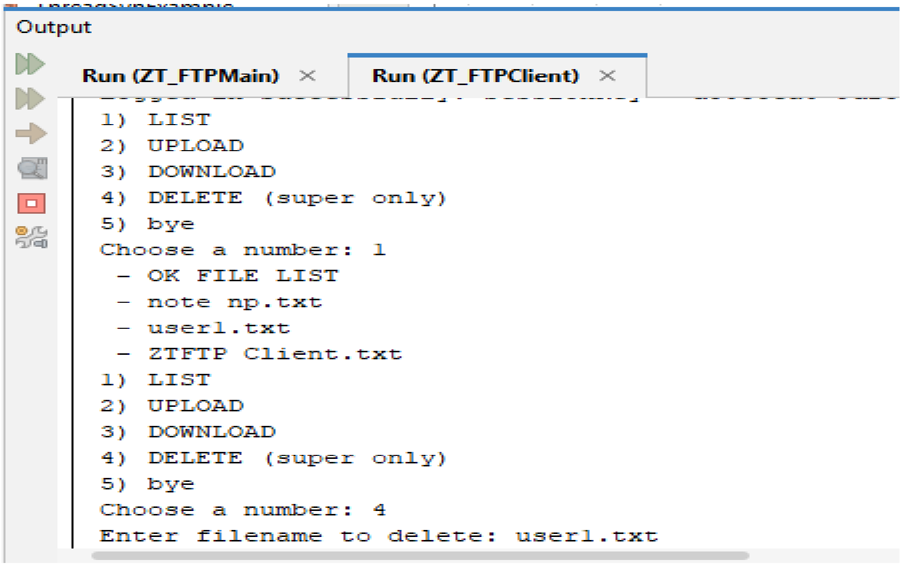
Figure 6: System behavior after multiple invalid session key errors



```
[2025-12-28 18:20:48] NEW CONNECTION from /127.0.0.1
[2025-12-28 18:20:54] LOGIN SUCCESS user=user1 role=normal
[2025-12-28 18:20:56] INVALID SESSION KEY user=user1 count=1
[2025-12-28 18:21:00] INVALID SESSION KEY user=user1 count=2
[2025-12-28 18:21:02] INVALID SESSION KEY user=user1 count=3
[2025-12-28 18:21:02] CONNECTION TERMINATED due to 3 invalid keys user=user1
[2025-12-28 18:21:02] THREAD ERROR: Socket closed
```

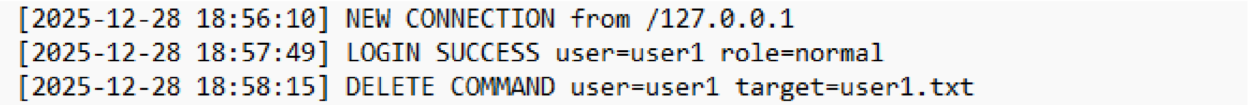
Figure 7: Server log showing connection termination after invalid session key attempts

2.3 Authorization Checks



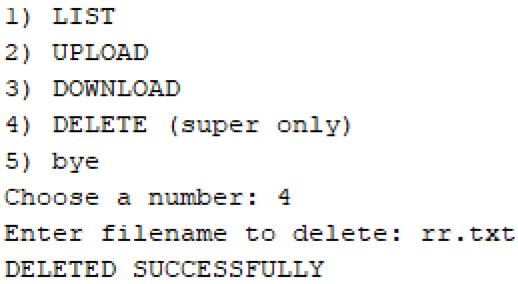
```
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 1
 - OK FILE LIST
 - note np.txt
 - user1.txt
 - ZTFTP Client.txt
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 4
Enter filename to delete: user1.txt
```

Figure 8: Authorized and restricted operations based on user role permissions



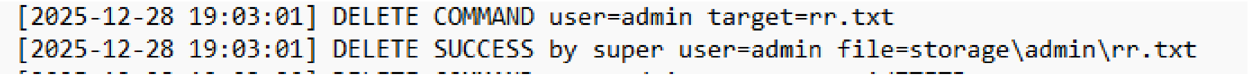
```
[2025-12-28 18:56:10] NEW CONNECTION from /127.0.0.1
[2025-12-28 18:57:49] LOGIN SUCCESS user=user1 role=normal
[2025-12-28 18:58:15] DELETE COMMAND user=user1 target=user1.txt
```

Figure 9: Server log showing delete command activity by a normal user



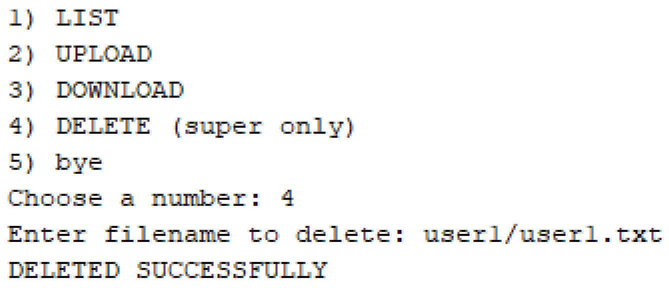
```
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 4
Enter filename to delete: rr.txt
DELETED SUCCESSFULLY
```

Figure 10: Authorized delete operation – client output



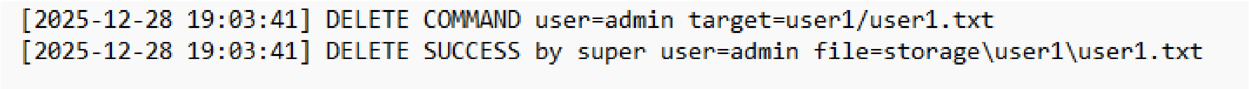
```
[2025-12-28 19:03:01] DELETE COMMAND user=admin target=rr.txt
[2025-12-28 19:03:01] DELETE SUCCESS by super user=admin file=storage\admin\rr.txt
```

Figure 11: Server log showing successful file deletion by super user



```
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 4
Enter filename to delete: user1/user1.txt
DELETED SUCCESSFULLY
```

Figure 12: Successful delete operation on a user file after authorization verification

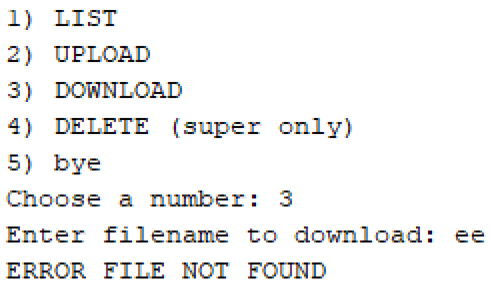


```
[2025-12-28 19:03:41] DELETE COMMAND user=admin target=user1/user1.txt
[2025-12-28 19:03:41] DELETE SUCCESS by super user=admin file=storage\user1\user1.txt
```

Figure 13: Server log showing successful user file deletion by super user

Test Case 1: Downloading a Non-Existent File

1. The client authenticates successfully and obtains a valid session key.
2. The client sends a DOWNLOAD command for a file that does not exist in the user's directory.

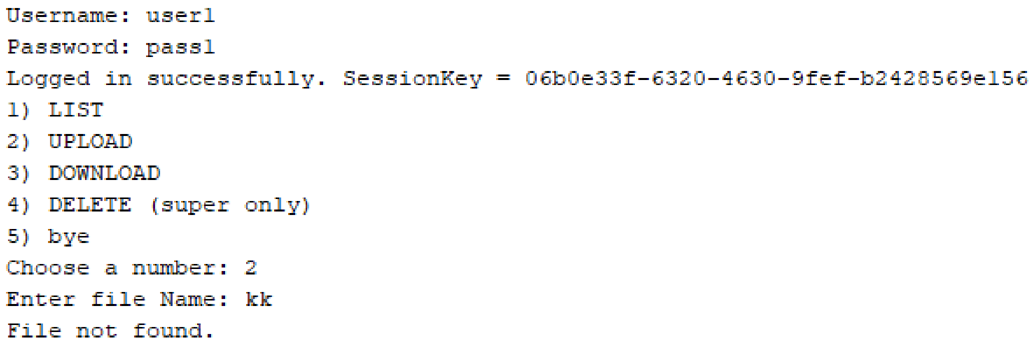


```
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 3
Enter filename to download: ee
ERROR FILE NOT FOUND
```

Figure 14: File not found error during download operation

Test Case 2: Uploading a Non-Existent File

1. The client authenticates successfully and obtains a valid session key.
2. The client sends a UPLOAD command for a file that does not exist in the user's directory.

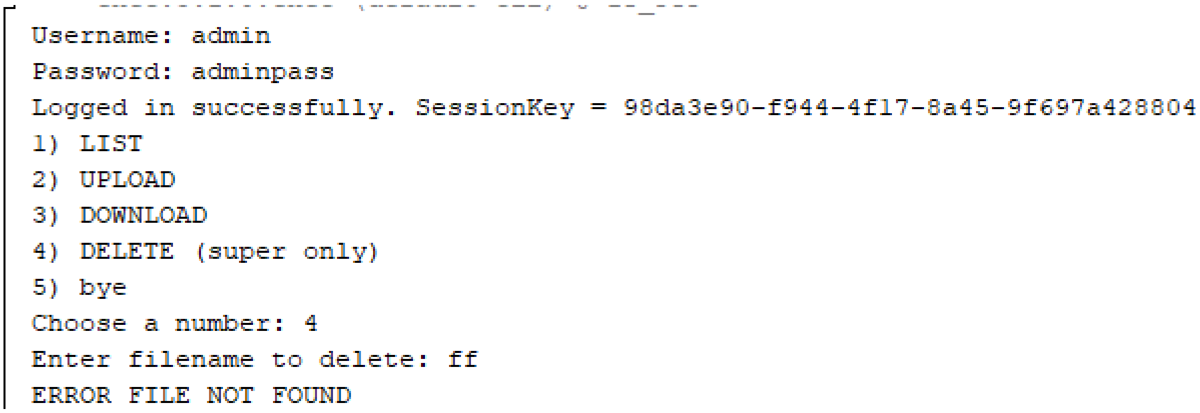


```
Username: user1
Password: pass1
Logged in successfully. SessionKey = 06b0e33f-6320-4630-9fef-b2428569e156
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 2
Enter file Name: kk
File not found.
```

Figure 15: File not found error during upload operation

Test Case 3: Deleting a Non-Existent File

1. The client authenticates successfully and obtains a valid session key.
2. The client sends a DELETE command for a file that does not exist in the user's directory.



```
Username: admin
Password: adminpass
Logged in successfully. SessionKey = 98da3e90-f944-4f17-8a45-9f697a428804
1) LIST
2) UPLOAD
3) DOWNLOAD
4) DELETE (super only)
5) bye
Choose a number: 4
Enter filename to delete: ff
ERROR FILE NOT FOUND
```

Figure 16: File not found error during delete operation by admin user