

## Program and Output:

```
~$ openssl genrsa -out priv-key.pem
Generating RSA private key, 2048 bit long modulus (2 primes)
.....+++++
.....+++++
e is 65537 (0x010001)
~$
```

```
~$
~$ cat priv-key.pem
-----BEGIN RSA PRIVATE KEY-----
MIIEpAIBAAKCAQEAA3oYlUmjYQNm+vX6ADC0PBe0LB0K7VEMsin+X6QMjchX66l
64CSpm7PDiumYLQK7tM4SjqFNVuJ+wzw6LyLDnVBVVe4dz0xdV0jeKnE7i6M5hD5
AR2aGSF2Q54KU3BKVhTQXnI2ZjicnJdHL14brbs6hPYT0Fd3+jadFw9ITDMUX8Z+
xcEXxqJ8oAXAVEJ8Q0Q0IjduNH9EHD68ZNTJSA1QsD6xWdNDzf2Szf06mVrCJf
xCaDRfMdd6azMa+78yhuc10GrpEI/YRQgZYRORUb2rXDIEp0wAME8PI9lHnQffFI
V4hOx8XVVQfd/79Q18aDCYooYNEbPukm3LEdMQIDAQABAoIBAQR8MPsOGlnpInO
bHEZ0tv6knzkGZmwzD7xLItwom6xo6RhyXFDXXNBcz1uprrK5IRBrhZ1+Jr1+ST
NF9oJQq4vEmagftogx306s0U/17rtIF8YdD7i3kicp6IZuepFw0bL+Hy6WCHIqte
uTkKLQGCJF2uqhfbFXSvXcdRxtq7vp62ic5C86XQ7tnnQUV8fb8ep+BxugNwN8Fr
RQjBp2a9YZCCQune82wgmV2xCZeztpMGO/jwnW6Eoh8sb/wXcmKqdUSLbm8Wnkt0
fZks5PcigXY4d3+oytKXjJ1smxjwyjBz83ia3dApanPgZmIgfVjysHgc4NJ3YPS
IKQtdI4BAoGBAPd195n7sNbeaXdpSfRmaHLknpltzV0oD98YlmdwQajofTDedvFw
kDZnjSvvdAlusjTzabT1XinzMMNCet+tt/pp0+EY4EeQr/lS3w0ewVEKqIOZrTgm
7LgRiuxKjZ+kfL0vfc3+Ax5NocLq5JP48+JfRYSvj6TVOPU3A5i4g50RAoGBAOYz
1sxkNCnZ9wEKYD1gBERR4RvezCCW40pxglTs1mRIiQlWBTJvEC3nog2dxa5cPLut
1uQoMRC1P6wji7NkAsdbvuNPzBdrLR3P939NzzN6useJw1N7URIRBZSJGDIXRanL
TEd8BzDrUPuJxI1cfSmu1HBbwM6i/Omrrn77s/4hAoGABeL5g+E34LSjv6HwsuAK
cAk+OJoje0VhM0Zra56Cq1jyABqaq72owJKQciaFFSBZhy5SdGqN1e0iG1L9dfmc
+EkCME2eNDWh6gYL/Ezp/lqJja/fLdoxswNBcZvy6IRhtcql7JWJT3Q7UAZJ77cx
XgY0Kibe/OXRmAu5+y00fHECgYAZ2VJSSyIsXORggqLB4Yk5HrSwkLl9I1RMZKiM
3rdINXjlynojoQMBFJR20P0Em6jaLjAGGJlB1ghbTPZ/40gImL27ipdrPeCoC1Uw
P013B10T0N1U/3DgBXD38Yb9AO36nfbNyn6IOLQ00ok0kocfahlcSjra2SRrHLMQ
YTUZ4QKBgQC3PqUG/cCDC+Ajgi+L5V6YCZiGZcFV8eZvP9sw5DehDb1mqpeI0nvw
8hi9aAqJ/1Y7Wcolba/gHC9wfng1e5QVNAJM0J5z7nOLRxf+5+JAEc7qimHkHQ/v
exDjJ2qb4dclPPlbQfQoj1CAv5UgFdmZGDTOWIk00Gb3Y1YC8t+rug==
-----END RSA PRIVATE KEY-----
~$
```

```
~$ openssl rsa -pubout -in priv-key.pem -out pub-key.pem
writing RSA key
~$
```

```
~$ openssl rsa -text -in priv-key.pem
RSA Private-Key: (2048 bit, 2 primes)
modulus:
 00:de:86:18:96:db:a6:8d:84:0d:9b:eb:d7:e8:00:
 c2:d0:f0:5e:3a:50:74:2b:b5:44:32:c8:a7:f9:7e:
 90:32:37:07:c7:ae:a5:eb:80:92:a4:ce:cf:0e:2b:
 a6:60:b4:0a:ee:d3:38:4a:3a:85:35:5b:89:fb:0c:
 f0:e8:bc:a5:0e:75:41:55:57:b8:77:33:b1:75:53:
 a3:78:a9:c4:ee:2e:8c:e6:10:f9:01:1d:9a:19:21:
 76:43:9e:0a:53:70:4a:56:14:d0:5e:72:36:66:38:
 9c:36:30:e1:2e:5e:1b:ad:bb:3a:84:f6:13:d0:57:
 77:fa:36:9d:17:0f:48:b4:33:14:5f:c6:7e:c5:c1:
 17:c6:a2:7c:a0:05:c0:55:e2:7c:43:c3:aa:d0:88:
 dd:50:d1:fd:10:70:fa:f1:93:6d:25:20:35:42:c0:
 fa:c5:60:cd:0f:37:f6:4b:3a:df:3b:a9:95:ac:22:
 5f:c4:26:83:44:59:83:77:a6:b3:31:af:bb:f3:28:
 6e:73:53:86:ae:03:c4:23:f6:11:40:6c:d8:44:ea:
 d4:6f:6a:d7:0e:27:8f:d3:06:8c:13:c3:c8:f6:51:
 e7:41:f1:48:57:88:4e:c7:c5:d5:55:07:c3:ff:bf:
 50:97:c6:83:09:8a:28:60:d1:1b:3e:e9:26:dc:b1:
 1d:31
publicExponent: 65537 (0x010001)
privateExponent:
 00:d1:f0:c3:ec:38:69:67:a4:89:ce:6c:71:33:d2:
 db:fa:92:7c:e4:19:99:b0:cf:00:fb:c4:b2:2d:c2:
 89:ba:c6:8e:91:87:25:c5:0d:75:cd:05:cc:f5:ba:
 9a:eb:2b:92:11:06:b8:59:d7:e2:6b:97:e4:93:35:
 ff:68:24:ea:b8:bc:49:9a:81:fb:68:83:1d:ce:ea:
 cd:14:ff:5e:eb:b4:81:7c:61:d0:fb:8b:79:22:72:
 9e:88:66:e7:a9:17:0d:1b:2f:e1:f2:e9:60:87:8a:
 ab:5e:b9:39:0a:2d:01:82:24:5d:ae:aa:17:c1:7d:
 74:95:5d:c7:51:c5:3a:bb:be:9e:b6:89:ce:42:f3:
 a5:d0:ee:d9:e7:41:45:7c:7d:bf:1e:a7:e0:71:ba:
```



```
writing RSA key
-----BEGIN RSA PRIVATE KEY-----
MIIEpAIBAAKCAQEAA3oYYltumjYQNm+vX6ADC0PBe0LB0K7VEMsin+X6QMjcHx66l
64CSpM7PDiumYLQK7tM4SjqFNVuJ+wzw6LyldnVBVVe4dzOxdVOjeKnE7i6M5hD5
AR2aGSF2Q54KU3BKVhTQXnI2ZjicNjDhLl4brbs6hPYT0Fd3+jadFw9ItDMUX8Z+
xcEXxqJ8oAXAVEJ8Q80q0IjdUNH9EHD68ZntJSA1QsD6xWDNDzf2Szf06mVrCJf
xCaDRFmDd6azMa+78yhuc10GrgPEI/YRQGzYR0rUb2rXDIEP0waME8PI9lHnQfFI
V4h0x8XVWQfD/79Ql8aDCYooYNEbPukm3LEdMQIDAQABoIBAQR8MPsOGlnpInO
bHEz0tv6knzkGZmwzWd7xLItwom6xo6RhyXFDXXNBcz1uprrK5IRBrhZ1+Jr1+ST
Nf9oJ0q4vEmagftogx306s0U/17rtIF8YdD7i3kicp6IZuepFw0bL+Hy6WCHIqte
uTKKLQGCJF2uqhfBfXSVXcdRxtQ7vp62ic5C86XQ7tnnQUV8fb8ep+BxugnNwN8Fr
RQjBp2a9YZCCQUne82wgmV2xCZeztpMGO/jwnW6Eoh8sb/wXCmKqdUSLbm8WnkT0
fZks5PcigXY4d3+oytKXjJ1smxjwyjBz83ia3dApanPgZmIgfVJysHgc4NJ3YPS
IKQtdI4BAoGBAPd195n7sNbeaXdpSfRmaHLknpltzVOoD98YlMdwQajofTDedvFw
kDZnjSvvdAlusjTZabT1XinzMMNCet+tt/pp0+EY4EeQr/lS3w0ewVEKqIOZrTGm
7LgRiuXKjZ+kFLOvfc3+Ax5Noc1q5JP48+JfRYSvj6TVOPU3A5i4g50RAoGBAOYz
1sxkNCnZ9wEKYD1gBERR4RvezCCW40pxglTs1mRIiQlWbtJVEC3nog2dxa5cPLut
1uQoMRC1P6wji7NkasdbvuNPzBdrLR3P939NzzN6useJw1N7URIRBZSJGDIXRanL
TEd8BzDrUPuJxI1cfSmu1HBbwM6i/Omrrn77s/4hAoGABeL5g+E34LSjv6HwsuAK
cAk+OJoJE0VhM0Zra56Cq1jyABqaq72owJKQCiaFFSBZhY5SdGqN1e0iG1L9DfMc
+EkCME2eMDWh6gYL/Ezp/lqJja/fLdoxswNBcZvy6IRHtcqL7JWJT3Q7UAZJ77cx
XgY0Kibe/OXRmAu5+y0QfHECgYAZ2VJSSyIsXORGgqLB4Yk5HrSwkLl9I1RMZKiM
3rdINXjlynojoQMBFJR20POEm6jaLjAGGJlB1ghbTPZ/40gImL27ipdRPeCoC1Uw
P013610T0N1U/3DgBXDJ8Yb9AO36nfBnyn6IOLQ00okOkocfah1CsJra2SRrHLMQ
YTUZ4QKBgQC3PqUG/cCDC+AjgI+L5V6YCZiGZcFV8eZvP9sw5DehDb1mqpeI0nvw
8hi9aAqJ/1Y7WcoLba/gHC9wfng1e5QVNAJM0J5z7nOLRxf+5+JAEc7qimHKHQ/v
exDjJ2qb4dc1PPlbQfQoj1CAv5UgFdmZGDTOWIk00Gb3Y1YC8t+rug==
-----END RSA PRIVATE KEY-----
~$
```

```
~$ cat > message.txt
I am in workshop
~$
```

```
~$ openssl rsautl -encrypt -in message.txt -pubin -inkey pub-key.pem -out cipher.bin
~$
```

```
~$ openssl rsautl -decrypt -in cipher.bin -inkey priv-key.pem -out decrypted.txt
~$
```

```
~$ cat decrypted.txt
I am in workshop
~$
```

```
~$ cat cipher.bin
~$
```

### Program:

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

```
public class MyClient {
    public static void main(String[] args) {
        try {
            Socket s = new Socket("localhost", 6665);
            DataOutputStream dout = new DataOutputStream(s.getOutputStream());
            dout.writeUTF("Hello Student");
            dout.flush();
            dout.close();
            s.close();
        } catch (Exception e) {
            System.out.println(e);
        }
    }
}

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

```
public class MyClient {
    public static void main(String[] args) {
        try {
            Socket s = new Socket("localhost", 6665);
            DataOutputStream dout = new DataOutputStream(s.getOutputStream());
            dout.writeUTF("Hello Student");
            dout.flush();
            dout.close();
            s.close();
        } catch (Exception e) {
            System.out.println(e);
        }
    }
}
```

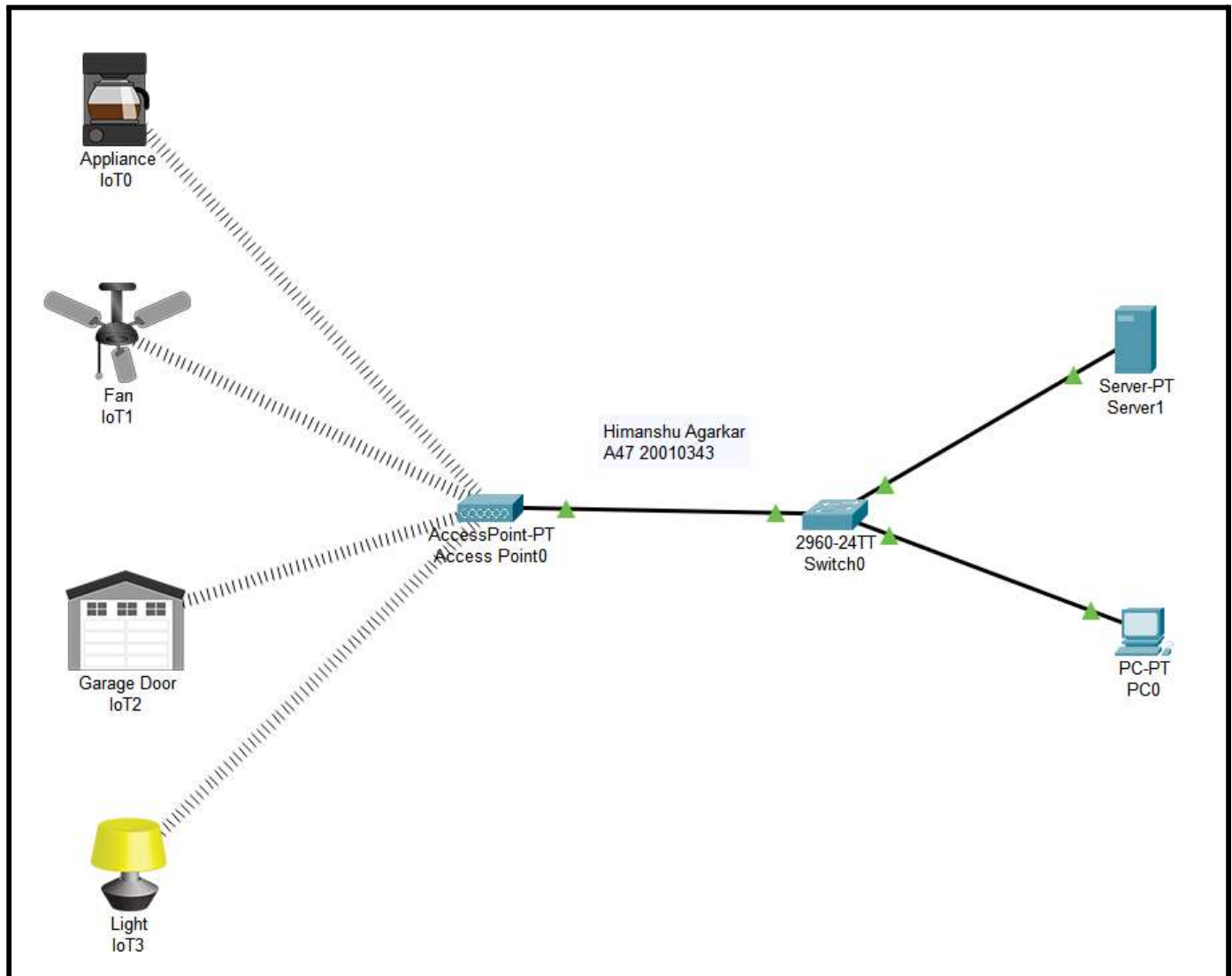
The screenshot displays the development environment for a Java socket program. It includes two terminal windows at the top and two code editors below. The left terminal shows the compilation and execution of MyClient.java, which outputs 'Hello Student'. The right terminal shows the compilation and execution of MyServer.java, which also outputs 'Hello Student'. The code editors show the source code for both files, which are identical in structure, using Socket and DataOutputStream to communicate over localhost:6665.

```
MyClient.java
1 import java.io.*;
2 import java.net.*;
3
4 public class MyClient {
5     public static void main(String[] args) {
6         try {
7             Socket s = new Socket(host: "localhost",
8                                   port: 6665);
9             DataOutputStream dout = new DataOutputStream(s.
10                getOutputStream());
11             dout.writeUTF(str: "Hello Student");
12             dout.flush();
13             dout.close();
14             s.close();
15         } catch (Exception e) {
16             System.out.println(e);
17         }
18     }
19 }
```

```
MyServer.java
1 import java.io.*;
2 import java.net.*;
3
4 public class MyServer {
5     public static void main(String[] args) {
6         try {
7             Socket s = new Socket(host: "localhost",
8                                   port: 6665);
9             DataInputStream din = new DataInputStream(s.
10                getInputStream());
11             String str = din.readUTF();
12             System.out.println(str);
13             s.close();
14         } catch (Exception e) {
15             System.out.println(e);
16         }
17     }
18 }
```

## Output:

All the devices are connected and switched off



All the devices are connected and switched on

