

Assignment 4

1) ClockServer.java

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

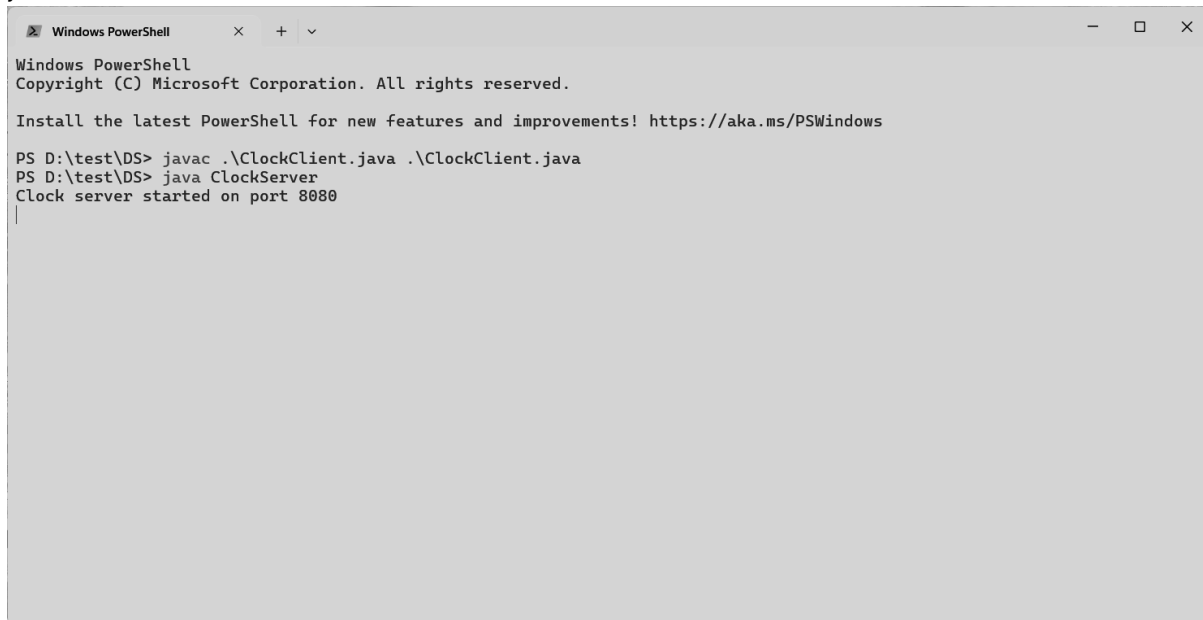
class ClockServer {
    private static final int PORT = 8080;
    private static final Map<String, Long> clientOffsets = new HashMap<>();
    private static final SimpleDateFormat dateFormat = new SimpleDateFormat("yyyy-MM-dd
HH:mm:ss");

    public static void main(String[] args) throws IOException {
        ServerSocket serverSocket = new ServerSocket(PORT);
        System.out.println("Clock server started on port " + PORT);

        while (true) {
            Socket clientSocket = serverSocket.accept();
            new Thread(() -> handleClient(clientSocket)).start();
        }
    }

    private static void handleClient(Socket clientSocket) {
        try (
            BufferedReader in = new BufferedReader(new
InputStreamReader(clientSocket.getInputStream()));
            PrintWriter out = new PrintWriter(clientSocket.getOutputStream(), true)
        ) {
            String clientTimeStr;
            while ((clientTimeStr = in.readLine()) != null) {
                long clientTime = dateFormat.parse(clientTimeStr).getTime();
                long offset = System.currentTimeMillis() - clientTime;
                clientOffsets.put(clientSocket.getRemoteSocketAddress().toString(), offset);
                long avgOffset =
clientOffsets.values().stream().mapToLong(Long::longValue).sum() / clientOffsets.size();
                String syncTime = dateFormat.format(new Date(System.currentTimeMillis() +
avgOffset));
                out.println(syncTime);
            }
        } catch (Exception e) {
            System.out.println("Client disconnected.");
        }
    }
}
```

}



```
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS D:\test\DS> javac .\ClockClient.java .\ClockClient.java
PS D:\test\DS> java ClockServer
Clock server started on port 8080
|
```

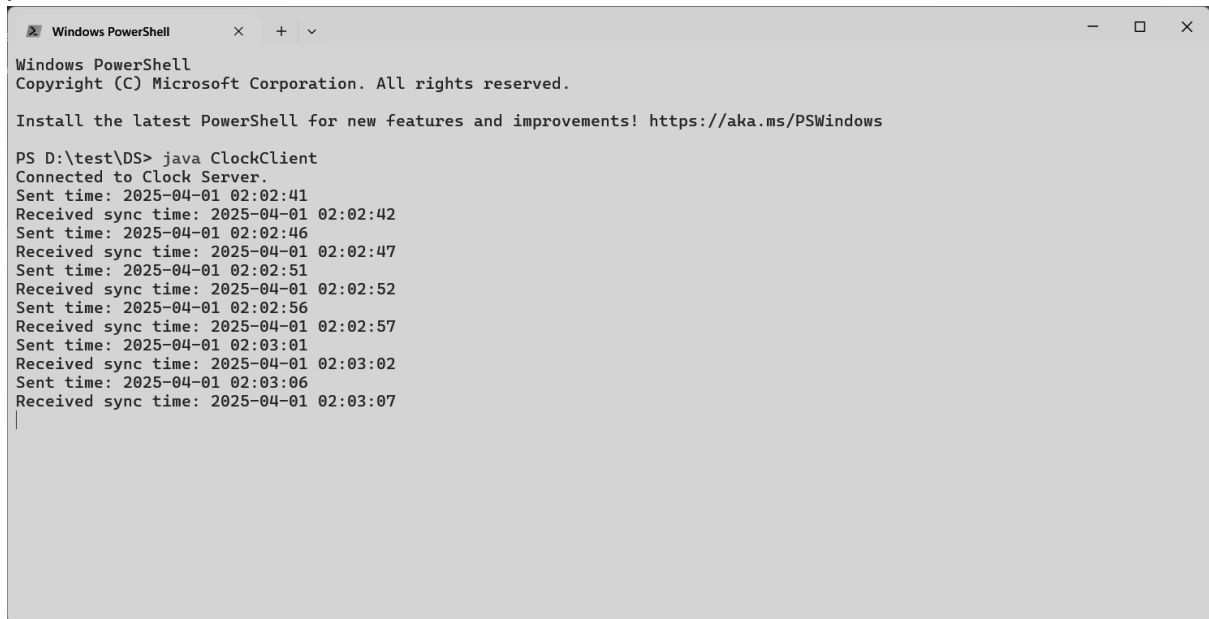
2) ClockClient.java

```
import java.io.*;
import java.net.*;
import java.text.SimpleDateFormat;
import java.util.Date;

public class ClockClient {
    public static void main(String[] args) {
        String server = "localhost"; // Change if needed
        int port = 8080;
        SimpleDateFormat dateFormat = new SimpleDateFormat("yyyy-MM-dd HH:mm:ss");

        try (
            Socket socket = new Socket(server, port);
            PrintWriter out = new PrintWriter(socket.getOutputStream(), true);
            BufferedReader in = new BufferedReader(new
InputStreamReader(socket.getInputStream()))
        ) {
            System.out.println("Connected to Clock Server.");
            while (true) {
                String currentTime = dateFormat.format(new Date());
                out.println(currentTime);
                System.out.println("Sent time: " + currentTime);
                String syncTime = in.readLine();
                System.out.println("Received sync time: " + syncTime);
                Thread.sleep(5000);
            }
        }
    }
}
```

```
    } catch (Exception e) {  
        e.printStackTrace();  
    }  
}  
}
```



The screenshot shows a Windows PowerShell window with the following text:

```
Windows PowerShell  
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PS D:\test\DS> java ClockClient  
Connected to Clock Server.  
Sent time: 2025-04-01 02:02:41  
Received sync time: 2025-04-01 02:02:42  
Sent time: 2025-04-01 02:02:46  
Received sync time: 2025-04-01 02:02:47  
Sent time: 2025-04-01 02:02:51  
Received sync time: 2025-04-01 02:02:52  
Sent time: 2025-04-01 02:02:56  
Received sync time: 2025-04-01 02:02:57  
Sent time: 2025-04-01 02:03:01  
Received sync time: 2025-04-01 02:03:02  
Sent time: 2025-04-01 02:03:06  
Received sync time: 2025-04-01 02:03:07  
|
```