

National University of Computer and Emerging Sciences



**Quiz 1**  
*for*  
**Operating Systems Lab**  
**(CL-220)**

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## Scenario: Secure Data Transformation

Imagine you are working as a security analyst in a high-stakes investigation firm. Your team has received a critical piece of evidence in the form of a text file containing sensitive information. However, the file is in a compromised state and needs to be securely transformed before it can be analyzed further. To ensure confidentiality and data integrity, you must develop a C/C++ program for secure data transformation with parent-child process interaction.

Here's the engaging scenario:

- **Background:** Your team has obtained a text file named "classified\_data.txt" that contains sensitive information crucial to an ongoing investigation. The file is highly confidential and has been tampered with, making it unreadable in its current state.
- **File Transformation Options:** You are presented with two transformation options to prepare the data for analysis:
  - **Option 1: Data Decryption** - This option will decrypt the contents of the file, provided you have a decryption key. The decryption process will be executed by a child process to maintain security. (Decryption Key: Shift 1 character backward (Caesar cipher))
  - **Option 2: Data Redaction** - This option will redact sensitive information within the file, replacing it with placeholders like "[REDACTED]." This is useful when you cannot access the decryption key.
- **Secure Transformation:** The program you develop must ensure the highest level of security during the transformation process. The decrypted or redacted data should never be exposed to unauthorized access.
- **User Interaction:** At the start of the program, you should prompt the investigator (user) to provide the names of the input and output files. Ensure that the user provides valid file names; otherwise, display an error message and terminate the program.
- **Transformation Choice:** Once the file names are provided, the investigator will be asked to choose one of the two available transformation options: Data Decryption (Option 1) or Data Redaction (Option 2).
- **Transformation Execution:** After the choice is made, your program will create a child process to perform the selected transformation while maintaining the utmost security. If the decryption option is selected, ensure that the decryption key is requested securely.
- **Data Handling:** The child process will execute the transformation without exposing any sensitive data. Once complete, it will return the transformed data securely to the parent process.

- **Report Generation:** The parent process will receive the transformed data and append it to the specified output file. Additionally, it should generate a report summarizing the transformation process and any additional actions taken, such as decryption or redaction.
- **Error Handling:** Your program should handle any errors gracefully, including invalid file names, incorrect transformation choices, or decryption key-related issues. Provide informative error messages to guide the investigator.

### Sample Input:

- Input File: "classified\_data.txt"
- Output File: "output.txt"

### Transformation Options:

- **Option 1: Decrypt Data** - This option will decrypt the contents of the file.
- **Option 2: Redact Data** - This option will redact sensitive information within the file.

### Scenario 1: Decrypt Data (Option 1)

Suppose you have the following encrypted data in "classified\_data.txt":

Encrypted Data: "Uifsf jt b tfdsfu npofz"  
 Decryption Key: Shift 1 character backward (Caesar cipher)

### Sample Output:

- Transformed Data: "There is a secret message" (appended to "output.txt")

### Scenario 2: Redact Data (Option 2)

The program scans the text for SSNs (in the format "###-##-####") and securely redacts them, replacing them with "[REDACTED]."

Suppose you have sensitive data in "classified\_data.txt" containing a social security number (SSN):

Original Data: "Please find enclosed the SSN: 123-45-6789."

### Sample Output:

- Transformed Data: "Please find enclosed the SSN: [REDACTED]." (appended to "output.txt")

In these scenarios, the program successfully performs the chosen data transformation (decryption or redaction) on the sample input data and appends the transformed data to the "output.txt" file.