

Cry – Project 2

(Software Requirements Specification): Presentation

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1 Introduction

- Summary
- Scope
- Definitions, Acronyms, and Abbreviations
- References

2 Overall Description

- Product Perspective
- Product Functions
- User characteristics

- Constraints
- Assumptions and Dependencies

3 Specific Requirements

- Interface
- Performance
 - Key Generation
 - Encryption
 - Decryption
 - Cryptanalysis
- Classes

4 Interview Log

- Summary

Section 1

Introduction

Subsection 1

Summary

Cry is a system targeted at cryptographers to allow them to easily benchmark their new cryptosystems.
It will also allow users to send and receive messages using any cryptosystem provided to Cry.

Subsection 2

Scope

- Cry will allow cryptographers to quickly develop new cryptosystems
 - It will do so by making testing and benchmarking easier
- Cry will also allow the encryption/decryption of data

Subsection 3

Definitions, Acronyms, and Abbreviations

- Cry: the cryptoframework under development
- Team Crybabies: the team responsible for the development of Cry
- Cryptographers: the target audience of Cry

Subsection 4

References

- **GMP (GNU Multiple Precision arithmetic library):** <https://gmplib.org/>
- **Msieve (General Number Field Sieve integer factorization library):**
<https://github.com/radii/msieve>

Section 2

Overall Description

Subsection 1

Product Perspective

- Cry will be implemented as a stand-alone framework, with built-in cryptosystems updated as needed
- User interface will start as command-line-based (possibility of implementing a GUI)

Subsection 2

Product Functions

Testing

- Develop new cryptosystems
- Test cryptosystems against cracking techniques and generate helpful output

Reporting

- Upon performing a test, a user will receive a report on the cryptosystem
- The report will indicate the security level of the cryptosystem

Subsection 3

User characteristics

Users will most likely have a medium to high level of experience with cryptosystems

Subsection 4

Constraints

- Basic memory and CPU availability
- Further library implementations or updates may require parallel operation or interfacing with other applications

Subsection 5

Assumptions and Dependencies

Assumptions and Dependencies

The only assumption of Cry is that it has applicable administrative permissions at the command line

Section 3

Specific Requirements

Subsection 1

Interface

- Alice wants to send a confidential message to Bob.
- Eve wants to eavesdrop that message.
- These end-users invoke their downloaded Cry binaries using command-line shells.

Subsection 2

Performance

Minimum hardware

RAM	4 GB
CPU	1.5 GHz

Key Generation by Bob

Input:

```
$ cry generatekeys -cryptosystem=<cryptosystem>
```

Output:

```
The public & private keys are <public key> & <private key>  
(took <key-generation time>).
```

Requirements:

- <key-generation time> shall be less than 1 minute

Encryption by Alice

Input:

```
$ cry encrypt -cryptosystem=<cryptosystem> \  
> -publickey=<public key> -plaintext=<plaintext>
```

Output:

```
The ciphertext is <ciphertext> (took <encryption time>).
```

Requirements:

- <plaintext> is an obviously meaningful string, such as ‘‘Eve is just a crybaby.’’
- <ciphertext> is an apparently meaningless string, such as ‘‘sdofA0VI29347asdjkADB234’’
- <encryption time> shall be less than 1 minute

Decryption by Bob

Input:

```
$ cry decrypt -cryptosystem=<cryptosystem> \  
> -privatekey=<private key> -ciphertext=<ciphertext>
```

Output:

```
The plaintext is <plaintext> (took <decryption time>).
```

Requirements:

- <decryption time> shall be less than 1 minute

Cryptanalysis by Eve

Input:

```
$ cry cryptanalyze -cryptosystem=<cryptosystem> \  
> -publickey=<public key> -ciphertext=<ciphertext>
```

Output:

```
The plaintext is <plaintext> (took <cryptanalysis time>).
```

Requirements:

- <cryptanalysis time> shall be more than 1 day

Subsection 3

Classes


```
using IntPtr = mpz_t; // GNU Multiple Precision Integer Type  
using Key = IntPtr;  
using Text = IntPtr;
```

```
class Cryptosystem {  
public:  
    virtual void generateKeys(Key publicKey , Key privateKey);  
        // set these  
  
    virtual void encrypt(Text ciphertext , // set this  
        const Text plaintext , const Key publicKey);  
  
    virtual void decrypt(Text plaintext , // set this  
        const Text ciphertext , const Key privateKey);  
  
    virtual void cryptanalyze(Text plaintext , // set this  
        const Text ciphertext , const Key publicKey);  
};
```

Section 4

Interview Log

- Participants wanted a report with as many details as possible
- Addition of other algorithms, especially AES
- Addition of a good pseudo-random number generator
- Implementation of certain libraries, like msieve

`https://github.com/vuphan314/cry`