

Project Ideas

Avinash Rajaraman

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The Objective

The Purpose of this assignment was to implement the following encryption methodologies and document the time taken for encryption and decryption by these algorithms on a file size greater than 100 MB. I have used these algorithms on a video file of size 197.5 MB. This video belongs to the Tonight show with Jimmy Fallon. The Algorithms are as follows: AES128, CTR Mode AES256, CTR Mode RSA1024 RSA4096 HMAC MD5 HMAC SHA1 HMAC SHA256.

Each of these algorithms was to run 100 times each against the file, and the mean and median times for the completion were to be recorded.

System Specifications

The system I used are of the following specifications. I am running Ubuntu 64 bit on Oracle Virtual Machine. The allocated storage space is 20 GB and the RAM allocated is 4GB. The execution cap is set at 100 percent and the number of processors allocated are 3. The VRAM allocated is 128 MB.

Observations:

- a) AES128 Encryption: This encryption technique was implemented in the Counter mode. This was successfully run 100 times. The average encryption time was: 1.222s and Decryption time was: 1.21s. The median encryption time was: 1.225s and Decryption time was: 1.119s.
- b) AES256 Encryption: This encryption technique was implemented in the Counter mode. This was successfully run 100 times. The average encryption time was: 1.311s and Decryption time was: 1.313s. The median encryption time was: 1.306s and Decryption time was: 1.3101s.
- c) HMAC MD5: This encryption technique was implemented and successfully run 100 times. The average hash time was: 7900ns and the median hash time was: 6000ns.
- d) HMAC SHA1: This encryption technique was implemented and successfully run 100 times. The average hash time was: 5100ns and the median hash time was: 4000ns.
- e) HMAC SHA256: This encryption technique was implemented and successfully run 100 times. The average hash time was: 8400ns and the median hash time was: 7000ns.
- f) RSA1024: I successfully implemented this, but I could not run it 100 times due to time constraints. Based on 20 executions, The average encryption time and Decryption time was: 1681.08s and the median of these times were: 1663.02.
- g) RSA4096: I successfully implemented this, but I could not run it even once due to time constraints. But it has successfully executed on files of substantially smaller size.

d) The screenshot showing HMAC SHA1 Implementation:

```

1 #include<stdio.h>
2 #include<stdlib.h>
3 #include<crypt.h>
4 #include<string.h>
5 #include<time.h>
6 #include "cryptogator.h"
7
8 #define GCRYPT_VERSION "1.6.4"
9 #define MAX_OPERATIONS 30
10
11 int main(int argc, char *argv[])
12 {
13     char *filename;
14     filename = "cg@cg-VirtualBox - /Downloads/Untitled Folder";
15
16     //Iteration 25
17     HMAC SHA1 key for Iteration No 25 is : lo67oieduoovlokl0ooeo7uulhr4
18     The Hash Generate using HMAC SHA1 is :
19     e5e0ee7015b88e74761dcf3d8f978a108aa0793
20     Total time taken for Hash Generation : 6000.00 nano-seconds
21     HMAC SHA1 key for Iteration No 26 is : wyaodllr3wdy7ldr7onlocslfoomsj
22     return
23     The Hash Generate using HMAC SHA1 is :
24     ee4e93bfde4ef583239685c72a893ce170a1c5d2
25     Total time taken for Hash Generation : 6000.00 nano-seconds
26     HMAC SHA1 key for Iteration No 27 is : d0oqolrgl0q1aycl1j7Aq1zseowr
27     The Hash Generate using HMAC SHA1 is :
28     c704ae5d324289ee090774f88ebbc21e5c3e37
29     Total time taken for Hash Generation : 6000.00 nano-seconds
30     HMAC SHA1 key for Iteration No 28 is : llodxolloorl0lsynpouaofholvaot8

```

e) The screenshot showing HMAC SHA256 Implementation:

```

1 #include<stdio.h>
2 #include<stdlib.h>
3 #include<crypt.h>
4 #include<string.h>
5 #include<time.h>
6 #include "cryptogator.h"
7
8 #define GCRYPT_VERSION "1.6.4"
9 #define MAX_OPERATIONS 30
10
11 int main(int argc, char *argv[])
12 {
13     char *filename;
14     filename = "cg@cg-VirtualBox - /Downloads/Untitled Folder";
15
16     //Iteration 28
17     HMAC SHA256 key for Iteration No 28 is : llodxolloorl0lsynpouaofholvaot8
18     The Hash Generate using HMAC SHA256 is :
19     66d1d9e564bdc282467f0758323cfc82437db2d103e397d09f55f3959bb43a
20     Total time taken for Hash Generation : 13000.00 nano-seconds
21     HMAC SHA256 key for Iteration No 29 is : qldlsooworlulion2k4cllnl0etr
22     The Hash Generate using HMAC SHA256 is :
23     2a0d1f0f3537b09eaf4556d1138a947234db0e09c08048027ced045
24     Total time taken for Hash Generation : 13000.00 nano-seconds
25     HMAC SHA256 key for Iteration No 30 is : xwlm3lladla7ux9llnltolow291
26     The Hash Generate using HMAC SHA256 is :
27     a151a1c0ab06400818130bc3f333f1d78adb7dae33f8b9c10c796a88
28     Total time taken for Hash Generation : 15000.00 nano-seconds

```

f) The screenshot showing RSA 1024 Implementation:

```

1 #include<stdio.h>
2 #include<stdlib.h>
3 #include<crypt.h>
4 #include<string.h>
5 #include<time.h>
6 #include "cryptogator.h"
7
8 #define GCRYPT_VERSION "1.6.4"
9 #define MAX_OPERATIONS 30
10
11 int main(int argc, char *argv[])
12 {
13     char *filename;
14     filename = "cg@cg-VirtualBox - /Downloads/Untitled Folder";
15
16     //Iteration 28
17     HMAC SHA256 key for Iteration No 28 is : llodxolloorl0lsynpouaofholvaot8
18     The Hash Generate using HMAC SHA256 is :
19     66d1d9e564bdc282467f0758323cfc82437db2d103e397d09f55f3959bb43a
20     Total time taken for Hash Generation : 13000.00 nano-seconds
21     HMAC SHA256 key for Iteration No 29 is : qldlsooworlulion2k4cllnl0etr
22     The Hash Generate using HMAC SHA256 is :
23     2a0d1f0f3537b09eaf4556d1138a947234db0e09c08048027ced045
24     Total time taken for Hash Generation : 13000.00 nano-seconds
25     HMAC SHA256 key for Iteration No 30 is : xwlm3lladla7ux9llnltolow291
26     The Hash Generate using HMAC SHA256 is :
27     a151a1c0ab06400818130bc3f333f1d78adb7dae33f8b9c10c796a88
28     Total time taken for Hash Generation : 15000.00 nano-seconds

```

Conclusions:

My findings based on the time taken $n=100$, by all the algorithms are that RSA 4096 costs the most, as the encryption and Decryption time of this is the maximum. In the increasing order of execution times, the algorithms are as follows: HMAC SHA1, HMAC MD5, HMAC SHA256, AES128 CTR, AES256 CTR, RSA 1024, RSA 4096.