

# Authenticity Data through Digital Signature Technique with MD5 Algorithm

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**Abstract:** Data entry must be done by a professional person because this process requires a high level of accuracy. If you enter incorrectly, the results given will also be inaccurate and can even cause misunderstanding. To maintain the authenticity of the data, digital signature techniques are used by using the MD5 algorithm as a hash function that is widely used in cryptographic applications are MD5 and SHA.

**Keywords:** Digital Signature, Message Digest, MD5.

## I. INTRODUCTION

Confidentiality of data in the process of sending data is needed to prevent information from being discovered by unauthorized parties. In addition to the issue of confidentiality, the issue of data authenticity is also very necessary for security, this is because if the recipient receives false data (data that is incompatible with the data sent by the sender) then there will be differences in meaning resulting in chaos and loss on both sides. One technique in using digital signatures is used so that the recipient is guaranteed that the data received is original data not fake data. This technique can prevent the use of false data by the data recipient. Every data received has a signature that is always different from other data, so that a little modification that is done will cause the signature to change very dramatically. [1]

## II. REVIEW CRITERIA

a method that directly accesses the records in a table by performing an arithmetic transformation on the key that is the address in the table. The hash function is the most widely used in the security of computer networks and the internet.[2] MD5 has been used in many fields to secure data authenticity. Broadly speaking, the process of creating a message digest on MD5 includes the following stages: [3]

### 1. Adding booster bits

The message is added by a number of bits of the block so that the message length (in bits) is congruent to 448 (mod 512).

### 2. Adding the original length value

The message that has been given the booster bits is further added to 64 bits which states the original message length

### 3. Initialize MD buffer

MESSAGE DIGEST 5

requires 4 buffers with buffer length is  $4 \times 32 \times 32 = 128$  bits.

can be seen that the buffer will be named A, B, C, and D.

here are initialized with values (in HEX notation) are

A = 01234567

B = 89ABCDEF

C = FEDCBA98

D = 76543210

### 4. Processing messages on 512-bit blocks

Messages are usually divided into L of 512 bits each (Y0 to YL-1). Each 512-bit block is processed together with the MD buffer into 128-bit output, and this is called the HMD5 process

The process can be seen in the image below: [3]

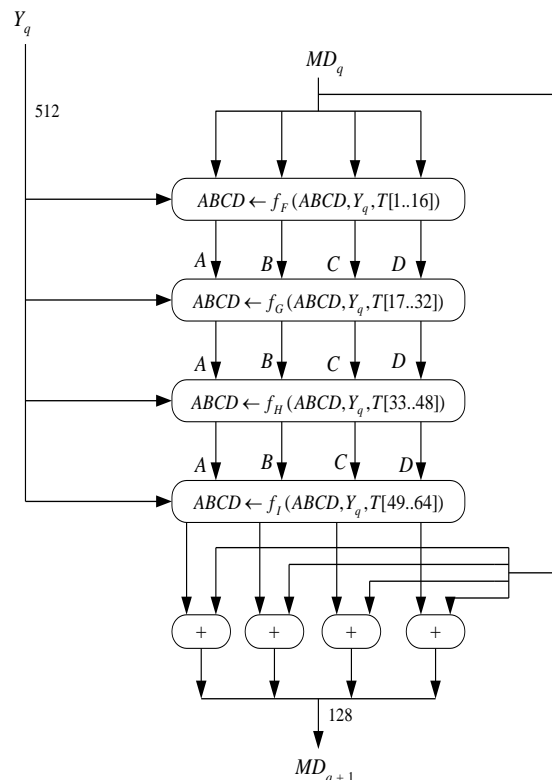


Figure 1. HMD5 process

The HMD5 process consists of 4 rounds, and each round performs MD5 basic operations 16 times and each basic operation uses a T element. So each round uses 16 elements of the T Table.

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## III. RESEARCH METHODS

The flow of research in this study is discussed in the diagram below:

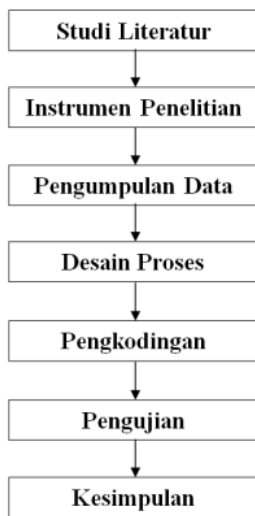
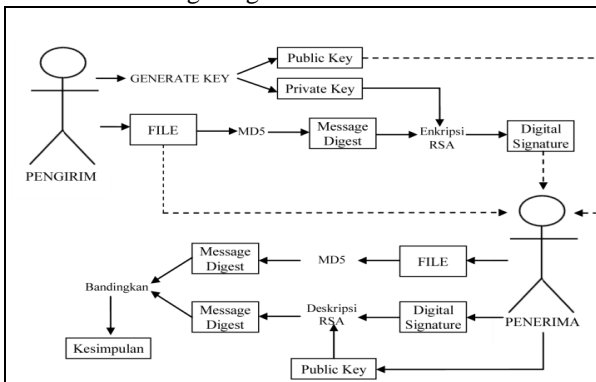


Figure 2. Research Methods

The flow of the digital signature generation process can be seen in the following image:



While the process of testing data authenticity can be seen in the flowchart below:

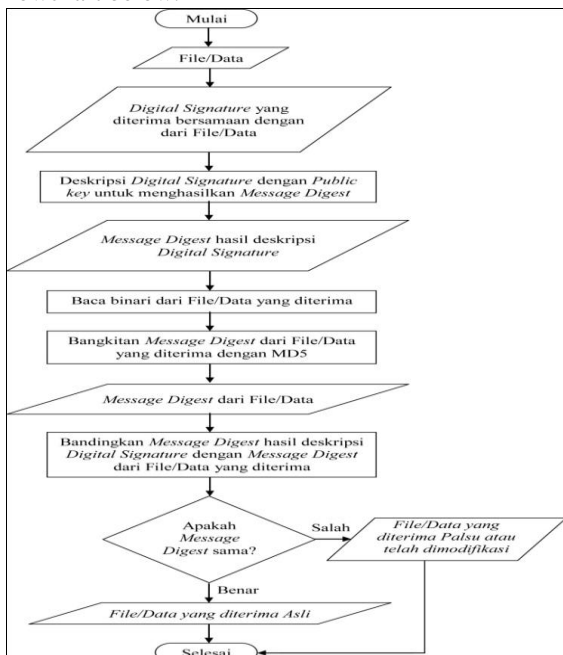
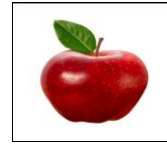


Figure 5. File / Data Authenticity Testing Process

## IV. RESULTS AND TESTING

The design process is implemented with the PHP programming language that is run with the Google Chrome browser. The web server that is used is XAMPP 1.7.3. Testing is done with several types of files. In the first test, an image file was tested, named Apple.jpg.



The program will automatically generate a hexadecimal number form. The resulting digital signature is in the form of a number based on 32. Namely a number consisting of a combination of the following symbols: 0,1,2,3,4,5,6,7,8,9, a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v. Decimal values obtained in digital signatures will be converted automatically by the program into a 32-based number system. The first try can be seen in the following image:



Figure 7. Digital Signature File Generation Results Apple.jpg

File Name: Apple.jpg  
 Private Key: (849f7, 1d0da7)  
 Public Key: (7, 1d0da7)  
 Digital signature: lkdg.18bfi.kq8k.18bfi.kq8k. rno3.18bfi.1nnc9.40lg.18bfi.18bfi.1nnc9.kq8k.6sil.lkdg.1k8m3.1c5ns.40lg.4fik.kq8k.18fi.sqq.6sil.40lg.0.18bfi.1dmpm.dc7f.1dmpm.1c5ns. Processing time: 0.29151821136475 The Apple. jpg file is sent with the public key, and the digital signature that has been generated. Private key is very confidential and if necessary destroyed, so that no party is able to revive the digital signature through the private key.



Digest message from Apple.jpg:  
 d2e2e62bc22bead43c8e20aeac029593  
 Public Key: (7, 1d0da7)  
 Description:  
 d2e2e62bc22bead43c8e20aeac029593



The file hasn't changed  
Processing time: 0.0019059181213379 ms  
The results of the second experiment showed that the Apple.jpg file did not undergo modification, so the Apple.jpg file received still maintained its data integrity.  
In Figure 8. The results of the second experiment can be seen, the digest message generated from the Apple.jpg file received is: d2e2e62bc22bead43c8e20aeac029593  
While the digital signature description results from the original Apple.jpg file give the same results as the message digest from the Apple.jpg file received, which are: d2e2e62bc22bead43c8e20aeac029593. In the third experiment, the Apple.jpg file will be slightly modified with Photoshop by adding a very small blue dot.

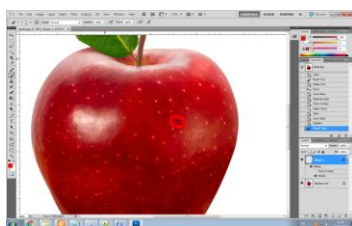


Figure 9. Modifications to the apple.jpg file

After the apple.jpg file has been modified, a fourth experiment will be performed to find out if a slight modification of the file will cancel the digital signature. The fourth experiment can be seen in the following picture:

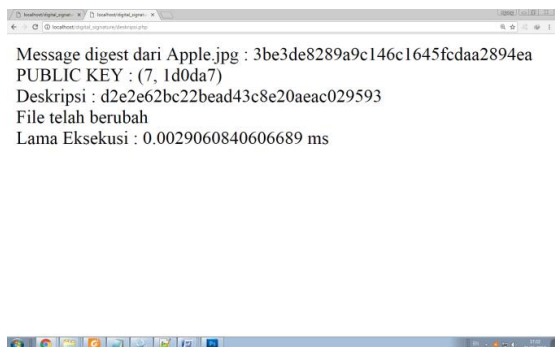


Figure 10. Fourth Experiment Results

The fourth trial result shows that the file has changed, the digital signature or the given digital signature has been canceled by the received Apple.jpg file, so the Apple.jpg file that has been received has been modified so that the data integrity of the Apple.jpg file has been attacked.  
In Figure 9, the results of the fourth experiment can be seen, the digest message generated from the Apple.jpg file received is: 3be3de8289a9c146c1645fcdad2894ea  
While the digital signature description results from the original Apple.jpg file are: d2e2e62bc22bead43c8e20aeac029593

Table 1. Results of experiments on several file formats

No	Form at File	Size dan Key	Key	Digital signature	proces sing time
1	.docx	78.9 KB	private key : (ab007, 257483) public key : (3, 14161f)	74ds.1h19m.9bfp.2a j23.1i711.1apct.s4g 4.1.1r76v.s2bc.74ds .s4g4.2aj23.28pj5.2 8pj5.0.mi54.74ds.28 pj5.28pj5.1h19m.28	0.6045 43924 33167

No	Form at File	Size dan Key	Key	Digital signature	proces sing time
			: (7, 257483)	pj5.1ovdl.1ovdl.1apct.1ovdl.1i711.28pj5.28pj5.74ds.1r76v.1h19m	
2	.xlsx	34.9 KB	private key : (1a9123, 1d442d) public key : (b, 1d442d)	0.1m39l.1jek1.vcda.e8lt.9h6f.1hrcr.1jek1.1hrcr.1.17kg7.1jek1.1hrcr.d7ob.722v.vcda.1.1qaa.1m39l.17kg7.e8lt.722v.9h6f.hv2q.hv2q.1gce6.e8lt.0.vcda.vcda.1hrcr.e8lt	1.2212 35990 5243
3	.txt	9.03 KB	private key : (5530d, 1aa997) public key : (5, 1aa997)	p2si.14r7t.0.lrh6.ge99.42ka.0.42ka.1cts9.0.1a6k1.14r7t.ge99.14s9p.1cadj.1cts9.p2si.42ka.h2gf.1a6k1.5do.5do.lrh6.h2gf.5do.1cts9.0.1cadj.14s9p.1cadj.1.5do	0.1995 46098 70911
4	.rar	2.68 MB	private key : (167aa1, 258355) public key : (5, 258355)	1hku7.1hku7.10pi1.16cet.21ui8.qmi3.t09q.79fu.1fch4.qmi3.21ui8.16cet.sqkf.1fch4.1gn77.1h98b.1qdbe.t09q.1gn77.qmi3.qmi3.1hku7.1qdbe.qmi3.21ui8.79fu.1gn77.1.79fu.dpnv.sqkf.21ui8	1.3432 11174 0112
5	.mp3	4.15 MB	private key : (1d88ad, 314735) public key : (5, 314735)	1mm15.of0.1mmpu.sk4.1mmpu.10bdg.10bdg.84up.1vfm.1qlnc.2mg22.2mg22.1pll.1qlnc.1qlnc.2duj b.0.41qq.1vfm.0.sk4.1vfm.1qlnc.1mmpu.1mmpu.1qlnc.1pl1.1vfm.10bdg.84up.1pll.84up	1.7518 99003 9825
6	.pdf	132 KB	private key : (173737, 1b2081) public key : (7, 1b2081)	b120.1.9553.1.irtp.1.g7n7.2rqc.0.1lo6s.9553.0.0.2rqc.2fih.apr5.apr5.0.2rqc.g7n7.71ol.15018.71ol.apr5.irtp.b120.9553.2fih.apr5.13h63.irtp.g7n7	0.8420 25041 5802
7	.mp4	3.54 MB	private key : (d5e1b, 14161f) public key : (3, 14161f)	thd7.heb2.2ssq.2ssq.13562.2.2ssq.1.10pus.10d0u.0.2.mcg3.heb2.1.2.81hd.10pus.81hd.13562.thd7.8qu9.10d0u.1.du5f.1.2ssq.9uug.2ssq.du5f.1.9uug	0.5943 33887 10022

V. SECURITY ANALYSIS

Without a private key, it cannot be just anyone who can generate a digital signature from a data.





If the attacker uses any private key, then the public key pair used by the recipient of the data will not match. Because different private keys will provide different public key pairs. Therefore, to strengthen the digital signature scheme, the private key should only be used for one time and immediately destroyed if it has been used to generate a digital signature so that it can no longer be used by other parties. MD5 processes variable length messages through input messages that are broken up into sections with sixteen endian blocks of thirty two message bits so that their length is divided by 512. This padding is between the main content and the broder which has a function like the first single bit added at the end of a sentence. This is followed by as many zeros as is needed to bring the message length to 64 bits less than a multiple of five hundred and twelve. The remaining bits are filled with sixty four integers representing the length of the original message in the bits. The main MD5 algorithm operates in conditions of one hundred twenty-eight bits symbolized A, B, C or D. This main algorithm operates on each block of messages as many as 512 bits in turn, each block modifying its portion.

## VI. CONCLUSION

From the experiments that have been done, digital signatures can provide security against the authenticity of the data, so that the recipient avoids using fake data that has been modified by the attacker to the detriment of the recipient or sender of the file. The slightest change that occurs to the data, will significantly change the existing digital signature, so that it will automatically cancel the digital signature given previously to the file.

Digital signatures can be generated by a combination of MD5 and RSA algorithms. The combination of these two algorithms can provide increased security for data authenticity. The MD5 algorithm has a 128-bit output, so it has 2128 possible combinations. The RSA algorithm prevents so that not just anyone can generate a digital signature from existing data, only the sender who has a private key can generate a digital signature. So the combination of these two algorithms will provide a high level of security.

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