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Nizomiddin Najmiddin ugli Ochilov
State Testing Center under the Cabinet of Ministers of the Republic of Uzbekistan
Uzbekistan, Tashkent

ANALYSIS OF INTERNATIONAL AND LOCAL STANDARDS OF INFORMATION PROTECTION IN MODERN OPERATING SYSTEMS

Abstract: *The article analyzes international and local standards in this field in order to ensure information security based on encryption algorithms in operating systems. Block encryption algorithms are widely used in open source operating systems. The encryption system, in turn, slows down the operating system. All encryption / decryption operations are performed invisible to the user. When the entire hard disk is encrypted (virtual memory files, temporary files), it is encrypted regardless of the level of importance.*

Key words: *encryption, decryption, standard, parallel computing, linear, differential, round, key length.*

Language: *English*

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Introduction

The purpose of this article is to ensure information security based on encryption algorithms in operating systems, as well as the use of cryptographic methods based on the analysis of international and local standards of information protection in modern operating systems.

In order to apply cryptographic algorithms in the operating system in the article, it is necessary to introduce a functional and flexible cryptographic subsystem in the system. The following subsystem program can be presented to users (program, service and service) in the form of a set of cryptographic algorithms. The cryptographic software of the operating system consists of two mechanisms [1].

Connection library of cryptographic functions. This mechanism is used at lower levels of the operating system (kernel level applications).

The operation of cryptographic functions is performed in the process of functions that determine the minimum latency of responses to queries. The amount of RAM required to perform such actions must be reserved in advance by the system administrator. Because the computer has a limited amount of RAM, libraries cannot be used anywhere [2].

Main part

In the Republic of Uzbekistan, there is a decryption/decryption algorithm based on the standard UzDSt 1105:2009, which describes the block encryption algorithm. This article presents the theoretical results obtained based on the standard UzDSt 1105:2009. In the cryptographic standard UzDSt 1105:2009, the table exchange consists of the replacement of 256 values, and according to the given formula, the bits on the arguments d, L, R, are formed depending on the extended k_{se} k_{ey}.

Modern operating systems use cryptographic methods of information protection everywhere. A special module is created to unify cryptographic functions into operating systems. This module includes various cryptographic functions.

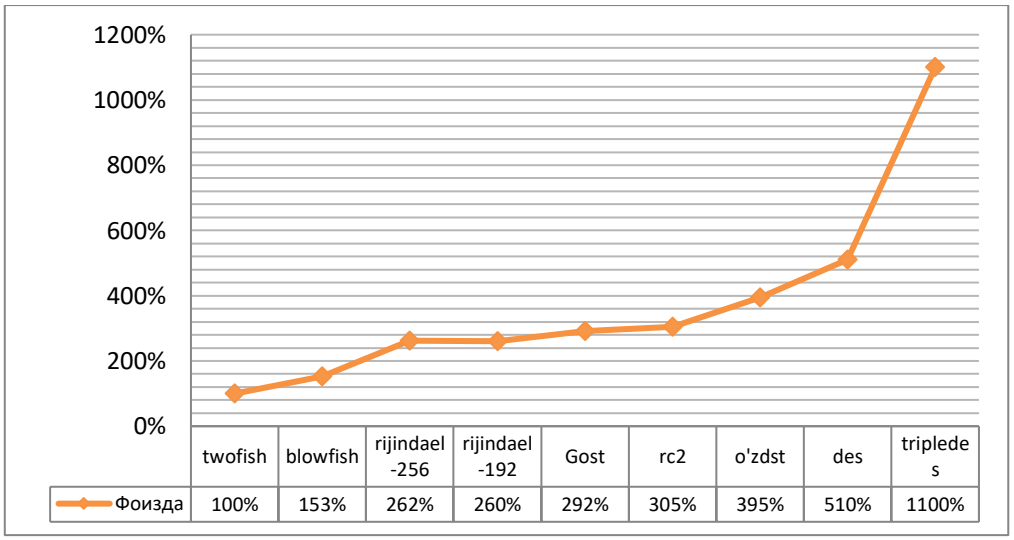
Ensuring information security is a priority of the international community is one of the functions. Cooperation between the states in this area is still developing, and in the Republic of Uzbekistan, special attention is paid to the protection of state secrets and confidential information.

From the results of the analysis (Figure 1), it can be seen that the twofish algorithm, which works in modern operating systems, is effective, but it is not registered as a standard in the Republic of Uzbekistan. Therefore, it does not fully comply with the

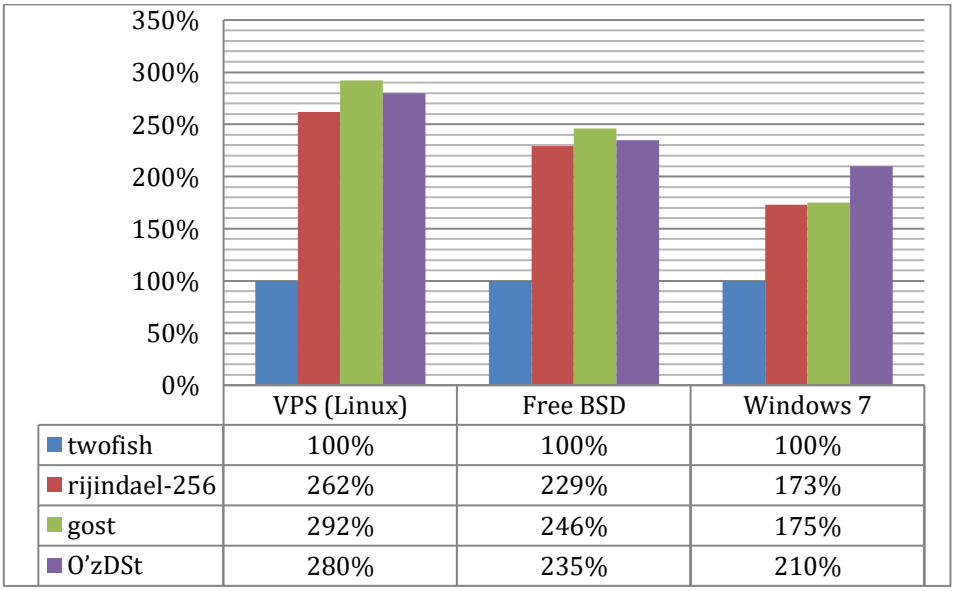
requirements of the legislation when working with confidential documents (Figure 2).

One of the most common encryption algorithms running on operating systems is the DES algorithm. In the DES algorithm, block exchange can occur in affine exchanges [2]. Many of the logical functions used in exchanges differ from the affine functions for only two of the sixteen possible sets of arguments, i.e., the nonlinear change in the DES algorithm is two (the nonlinear change in a 4-bit change is four). This in turn increases the resilience of the DES encryption algorithm to differential and linear cryptanalysis. Also, DES, if x, z - is plain text and a key, the following equation DES (x, z) = DES (x, z) has the property of being reasonable. This is a disadvantage of the DES encryption algorithm, which halves the selection method performed when the key is detected at the level of accuracy for the intruder. After the advent of differential cryptanalysis, the DES algorithm was able to reduce its tolerance to 237 levels. Later, these figures were also reduced using linear cryptanalysis. It should be noted that the determination of keys using the differential method is based on the assumption that different keys are used for each round.

Therefore, an increase in the number of keys does not significantly increase the robustness of this algorithm.



1. Figure. Speed of execution of all encryption algorithms running on operating system



2. Figure. Encryption algorithms in modern operating systems

In the encryption algorithms GOST 28147-89 and UzDST 1105:2009, switching blocks, as in DES, are not installed and are confidential. The key used in encryption is 256 bits, which increases the crypto currency tolerance.

Experiments with the DES algorithm have shown that wildcard replacement significantly reduces the reliability of the algorithm. Distribution mechanisms are different in the algorithms GOST 28147-89 and DES. If in DES the replacement of bit blocks in the mat is achieved, then in GOST 28147-89 this is done by adding 232 modules. The experimental results show that to ensure stability against differential and linear cryptanalysis methods, it is advisable to select extreme substitutions with linearity 4 and distribution 1. In addition, the largest difference between the two substitution results should have the least probability (the sum of the differences is determined by modulus 2). Finding such differences poses significant challenges. The number of cycles in GOST 28147-89 is twice as much as in DES. Cryptanalysis of GOST 28147-89, consisting of 24 cycles, shows that its tolerance for random replacement blocks is 254.

$$\left\{\left[\left((i+L)\ mod\ 256\right)+1\right]^{d}\right\}\ mod\ 256$$

Here is the d - R upgrade. The total number of replacement tables generated based on various values of these parameters is 4,161,600. Therefore, our main goal is to analyze the method of automatic quality control of the switching tables used in the encryption algorithm of the UzDSt 1105:2009 standard. The algorithm used in the UzDSt 1105 cryptographic standard: 2009 of the Republic of Uzbekistan is relatively new because it is relatively new. The analysis of the UzDSt 1105:2009 cryptographic standard uses a parallel algorithm that automatically evaluates its replacement tables. Allows you to parse arbitrary replacement tables based on the generated algorithm. For example, you can improve this algorithm when checking the stability of all 4-bit switch tables or specific function classes. Since the S-box is the "heart" of the entire cryptosystem, the results of his research are of great practical importance.

The main object of our analysis is the exchange table, consisting of the exchange of natural numbers. A lookup table or lookup field is a bijective transformation.

$$F\colon \mathbb{F}_2{}^n \longrightarrow \mathbb{F}_2{}^n$$

There $\mathbb{F}2$ is a secondary limited area.

F can also be calculated as a system of logical functions (f: {0, 1} n ⟶ {0, 1} n):

$$F(x_1, x_2, \ldots, x_n) = (f_1, f_2, \ldots, f_n)$$

Therefore, the i-function is called F_i, the i-component of the vector. We express $x = (x_1, x_2, \ldots, x_n)$, x_i. We define the binary vector 1 in the i-position as $e_i = (0, 0, \ldots, 1, 0, \ldots, 0)$.

$$\sum\nolimits_i = \{(x', x''): x', x'' \in X, x_i' + x_i'' = e_i\},$$

$$i = \overline{1,n}$$

$$\sum = \bigcup_{i=1}^{n} \Sigma_i$$

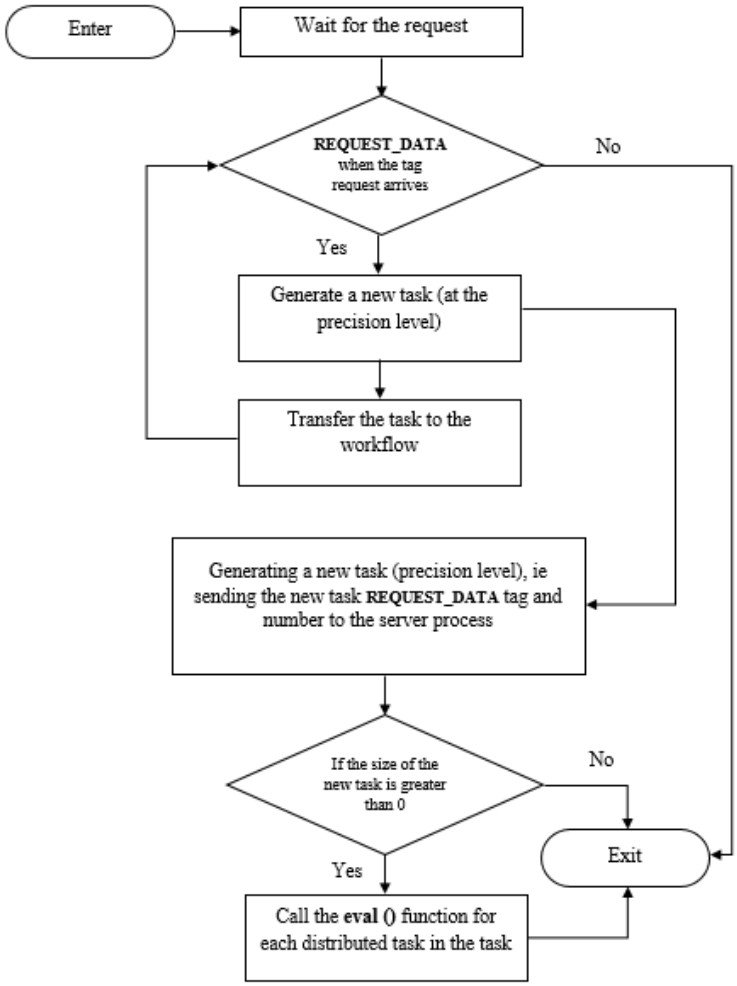
If n of any of the incoming bits changes, and each of the outgoing bits varies with probability p = ½, then F satisfies the basic strict criterion. F satisfies the basic strict criterion if

$$P\left(v_i^j = 1\right) = \frac{1}{2}, \forall\, j = \overline{1,n}$$

$$v_i = (x', x'') = F(x') + F(x''), (x', x'') \in \Sigma_i$$

herefore, parallel algorithms with high scale and accuracy based on parallel computing technology were created through OpenMPI (library of message transmission interface). The algorithm automatically adapts to the computing resources given to it-the number of computational processes-without changing the code. In addition, the high accuracy ensures that none of the computers in the cluster running the algorithm will run idle, even if they have different parameters. There are at least two calculation processes, and they are all numbered (from 0). One of the processes is called the server process (from 0) or simply in the server cluster. The rest are called computing or working processes. Server performance algorithms and workflows differ. The server devices are responsible for breaking down the initial task into smaller classes of a certain size (set in the compilation of the program). The algorithm is presented in block diagram 1.2.

In order not to lose all data during a power outage or power outage while the program is running, data of a certain frequency is written to temporary files using functions in the log file. The total number of replacement tables generated on the basis of the different values above was 4,161,600, for each of which a linear and differential method was used to automatically perform the quality assessment eval () function and organize the attacks. If tables are identified during the linear analysis process, then the independence criteria for such tables are not met. Based on the results obtained, it is possible to confirm that the replacement tables are resistant to linear and differential analysis, which is sufficient for more than 4 rounds. The encryption algorithm UzDSt 1105:2009 and the difference between GOST 28147-89 are given in Table 1.2 and the encryption algorithms in other foreign countries.



1.2. Block diagram. Algorithm block diagram based on parallel computing technology.

The analysis of the encryption standard UzDSt 1105: 2009 revealed the following:

-UzDSt 1105: 2009 encryption algorithm uses 2 keys: an encryption key and a functional key, each of which is a 256-bit sequence. The interaction of these keys is equivalent to the use of a 512-bit encryption key in the encryption algorithm, which in turn prevents the possibility of unauthorized decryption of data;

-if high-level security elements are used, the functional key is changed in each session;

-The encryption standard UzDSt 1105: 2009 has been confirmed to be resistant to linear and differential analysis, which requires more than 4 rounds.

Conclusion

It can also be seen from the results of the analysis that the analysis of encryption modes was carried out using parallelism tasks when assessing the quality of encryption algorithms. This article compares data encryption/decryption standards in modern and open source operating systems, evaluates processing speed and cryptanalysis, and shows that the UzDSt 1105:2009 encryption standard is resistant to linear and differential analysis, as well as the GOST 28147-89 encryption algorithm. High-dimensional and high-precision parallel algorithms based on parallel computing technology were created through OpenMPI (Library of Interface). The total number of conversion tables to the UzDSt 1105: 2009 encryption algorithm is 4,161,600.) Functions and attacks were organized and cryptographic resilience was determined.

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