ADVANCE ENCRYPTION SYSTEM AND INTERNATIONAL DATA ENCRYPTION ALGORITHM FOR VIDEO ENCRYPTION: A REVIEW

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Abstract: **Video streaming over a wireless network such as mobile ad hoc network (MANET), where wireless terminals (like Personal Device Assistance, mobile phones, palmtops) access in video conferencing system, new challenges will be brought about. First for all, a refactoring for original system with security design should be considered due to limited wireless bandwidth for wireless terminals. In addition, a lightweight encryption algorithm to protect media data should be given due to limited battery power & computational resource. Proposed work is a Design of Secure Video Encryption module with a new Key based Frame Isolation technique & International Data Encryption Algorithm (IDEA) Encryption may be named Key based Frame Isolation & IDEA Encryption (KFI2E). KFI2E is also useful when we store our confidential video or image on cloud server it so it will be secure we just have to save an encrypted videos & images on cloud servers & it is a new key based algorithm to find out frame & specific pixel in video & use IDEA encryption instead for AES. Proposed methods causes significant speed enhancement for video encryption with similar security in near future.**

Keywords: **IDEA: International Data Encryption Algorithm., NIDS: Network Intrusion Detection System., MPEG: Moving Picture Action Group, PSNR: Peak Signal to Noise Ratio, KFI2E: Key based Frame Isolation & IDEA Encryption**

I-INTRODUCTION

Today, there are several to video encryption-based security solutions available in many companies or origination in market areas, it may be Financial Services & Broadcasting to Government. Encryption has proven its name as a secure & universally applicable block encryption algorithm, encryption permits effective protection to transmitted & stored data against unauthentic access by third parties (intruders). Basic criteria to development of encryption were very high security requirements along with less easy, hardware & software implementation with fast execution. Video encryption may be used to protect information transmission & storage.

With development for network multimedia system, systems will make continuous media streaming. It is very important to secure networked continuous media data from potential threats such as hackers, eavesdroppers etc. applications as streaming are endless such as video conferencing, interactive web site etc. In all streaming applications, high volume for data is transmitted over network. Since traditional encryption algorithms often fail due to extra high volume & latency sensitiveness for media data, security becomes a challenging task. Sending a video stream (such as Video conferencing) over a network in real time which is necessary that transmitted frames are sent in a limited delay. Moreover, video frames needs to be display at a certain interval. Quality of video is directly proportional to frame rate. So, if we want to achieve good quality video transmission it is required that a number for frames will transmitted over network in a fixed time frame; therefore, sending & receiving encrypted packets must be sent in a certain amount for time in order to achieve quality video transmission over network.

II -LITERATURE SURVEY

Haojie Shen et al [1] In this paper, they presented a procedure based on both prediction mechanism for H.264encoder & syntax for H.264 bit stream, an efficient selective video encryption algorithm is proposed. Figure 1 below shows working for Haojie Shen et al here it may be observed that they have taken video & then apply it on Discrete Cosine Transform (DCT) [1] transformation module which isolate high & low frequencies out for videos & then they isolates high frequencies pixels from various frames & keep rest for pixels unchanged, they applies Advance Encryption System (AES) on selected pixels & they developed a ciphered pixels & at last they mix cipher & un-cipher pixels & frames & develop ciphered video.

Haojie Shen et al [1] develop a good procedure as video encryption & they used DCT[1] based frame high & low frequencies pixels isolation & than perform encryption on high frequencies only that make many for change in original videos & develop a video with huge change in output video & make it unrecognisable. They used AES as encryption, problem will be arrive when a video with too many high frequencies their procedure fails because they have to perform Encryption on many pixels which make their procedure slow & dependent on type of video. Second they used AES encryption as we know AES encryption is very good when security concerns however also necessary too many computation S-box & memory element which make AES[3] slower. Propose work is using IDEA encryption technique instead for AES& using a new formula based Frame pixel finder which rely on KEY given not on type of video.

M. Li et al [2] In this article AES algorithm is used to encrypt video slice layer. They establish an encryption system for Hadoop cluster based on Map Reduce framework, to improve video encryption speed & optimize video encryption strategies. P. Deshmukh et al [3] use Moving Picture Action Group (MPEG) video stream is quite various from traditional textual data because inter-frame dependencies exist in MPEG video they use Advanced Encryption Standard (AES) algorithm is used & modified it, to reduce calculation for algorithm & as improving encryption performance. Kai huang et al [4] Context based adaptive binary arithmetic coding (CABAC) is major entropy coding algorithm employed in H.264/AVC.

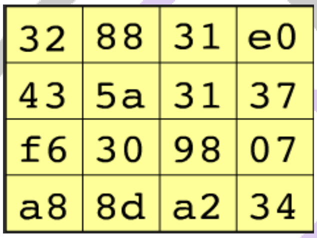
In this paper, they present a new architecture design as an H.264/AVC CABAC decoder, which optimizes both decode decision & decode bypass engines as high throughput, & improves context model allocation as efficient external memory access. Saranya. P et al. [5] Using H.264 to compress & encrypt, videos may resolve speed & security problems in mobile application. Protecting video information by encrypting selective data is crucial element. Considering limited resource & bandwidth for mobile devices, a selective video encryption algorithm, is proposed based on special features for H.264. In this algorithm, luminance transform coefficients for residual data are selectively encrypted. Experimental results demonstrate that proposed algorithm encrypts much less important data & achieves good security & high efficiency.

III-- ADVANCE ENCRYPTION STANDARD

The AES[3] algorithm consists to four various easy operations.

AES is a symmetric block cipher[5]. This means that it uses same key to both encryption & decryption. However, AES[3] is quite various from DES in a number of ways. Algorithm Rijndael allows to a variety of block & key sizes & not just 64 & 56 bits to DES' block & key size[5]. Block & key may in fact be chosen independently from 128, 160, 192, 224, 256 bits & need not be same. However, AES[3] standard states that algorithm may only accept a block size to 128 bits & a choice to three keys - 128, 192, 256 bits. Depending on which version is used, name to standard is modified to AES-128, AES-192 or AES- 256 respectively. As well as these differences AES[3] differs from DES in that it is not a festal structure[5]. AES [3] used to encrypt & decrypt 128 bit plain text block. To encrypt this plain text we required 3 modes: 128 bit, 192 bit 256 bit. Each has corresponding number to round. To encrypt data we required 128 bit matrix & each row contains four bytes to group. 4*4 Matrix is given below.

If 128 bit in hexadecimal 3243F6A8885A308D313198A2E0370734

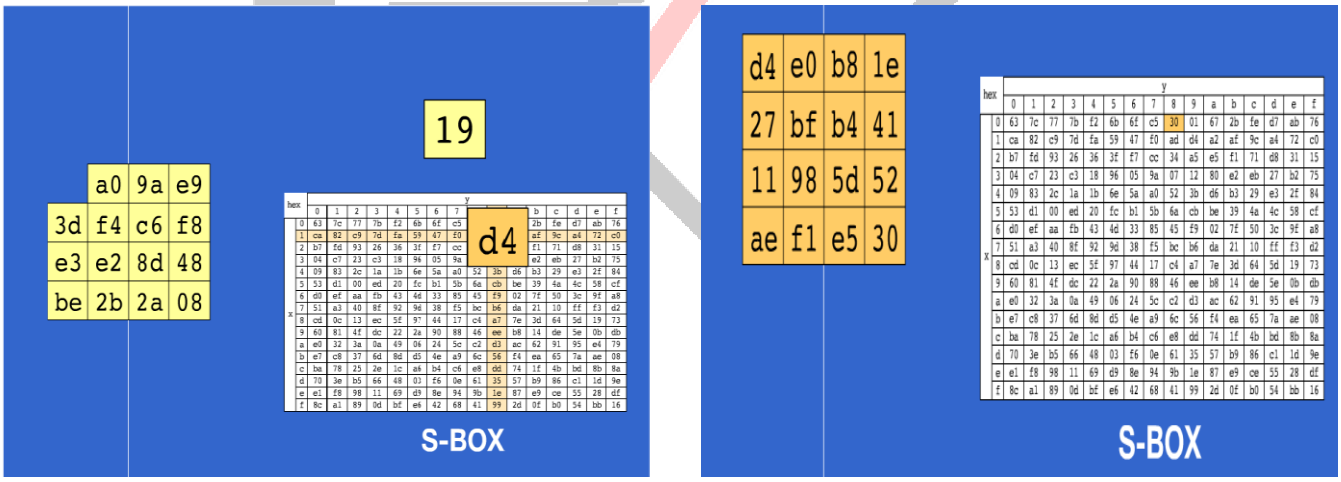


32	88	31	e0
43	5a	31	37
f6	30	98	07
a8	8d	a2	34

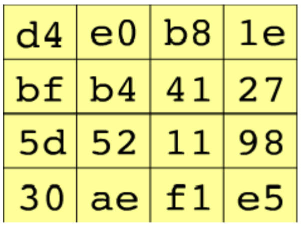
Figure 1 AES original data

Sub Bytes: All bytes are processed separately & it is a nonlinear byte substitution. Sub byte is invertible & constructed by composition to following two transitions. Substitution byte stage is completed with help to S-box. S-box is fixed & it is nothing however a matrix. Particular value in S-box may be determined by breaking bytes into nibble, left most nibble to byte is specify particular row of S-box & right most nibble to S-box is specifies column to example byte {19} select row 1, column 9 which contains value {d4}. This value is used to update state matrix. We may understand this procedure with help to diagram given below:

Figure 3: S-Box substitution in AES[3]



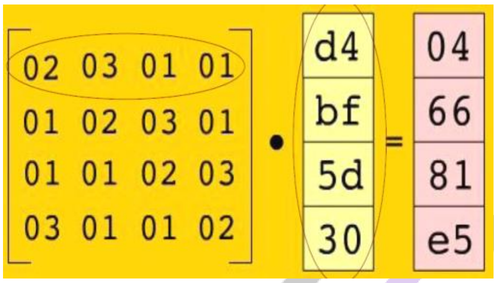
Shift Row: In this stage, first row is not change, second row is circular shifted by 1 byte to left, third row is circular shifted by 2 byte to left, & fourth row is circular shifted by 3 byte to left.



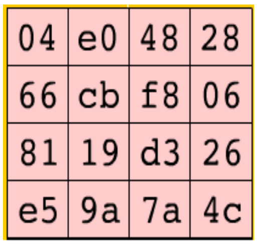
d4	e0	b8	1e
bf	b4	41	27
5d	52	11	98
30	ae	f1	e5

Figure 4 after performing shift Row [3]

Mix column: Mix column transformation operates column by column & this column will be considered as a four term polynomial. Column are consider as four term polynomial over GF(2^8) are multiplied x^4+1 with fixed polynomial a(x) is given by:



$$\begin{bmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{bmatrix} \bullet \begin{bmatrix} d4 \\ bf \\ 5d \\ 30 \end{bmatrix} = \begin{bmatrix} 04 \\ 66 \\ 81 \\ e5 \end{bmatrix}$$

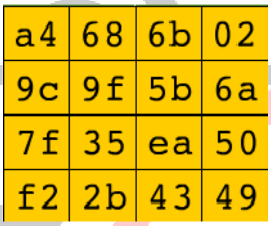


04	e0	48	28
66	cb	f8	06
81	19	d3	26
e5	9a	7a	4c

Figure 5 first column to matrix obtained after shift row to generate first column to Mix column process [3]

To get r0 value, formula goes like this:
r_0 = {02.d4} + {03.bf} + {01.5d} + {01.30}
here '+' will logical XOR & multiplication by 01 is do nothing, multiplication by two is arithmetic shift by '1' & multiplication by 03 is arithmetic shift by '1' with logical XOR with it original.

Add Round Key: In this transformation 128 bit to stage are bitwise XOR with 128 bit to round key. Operation is viewed as a column wise operation between 4 bytes of a state column & one word to round key.



a4	68	6b	02
9c	9f	5b	6a
7f	35	ea	50
f2	2b	43	49

Figure 5 after adding round Key into data[3]

The same procedure as explain above done to eight much rounds & at last one sub-round performed.

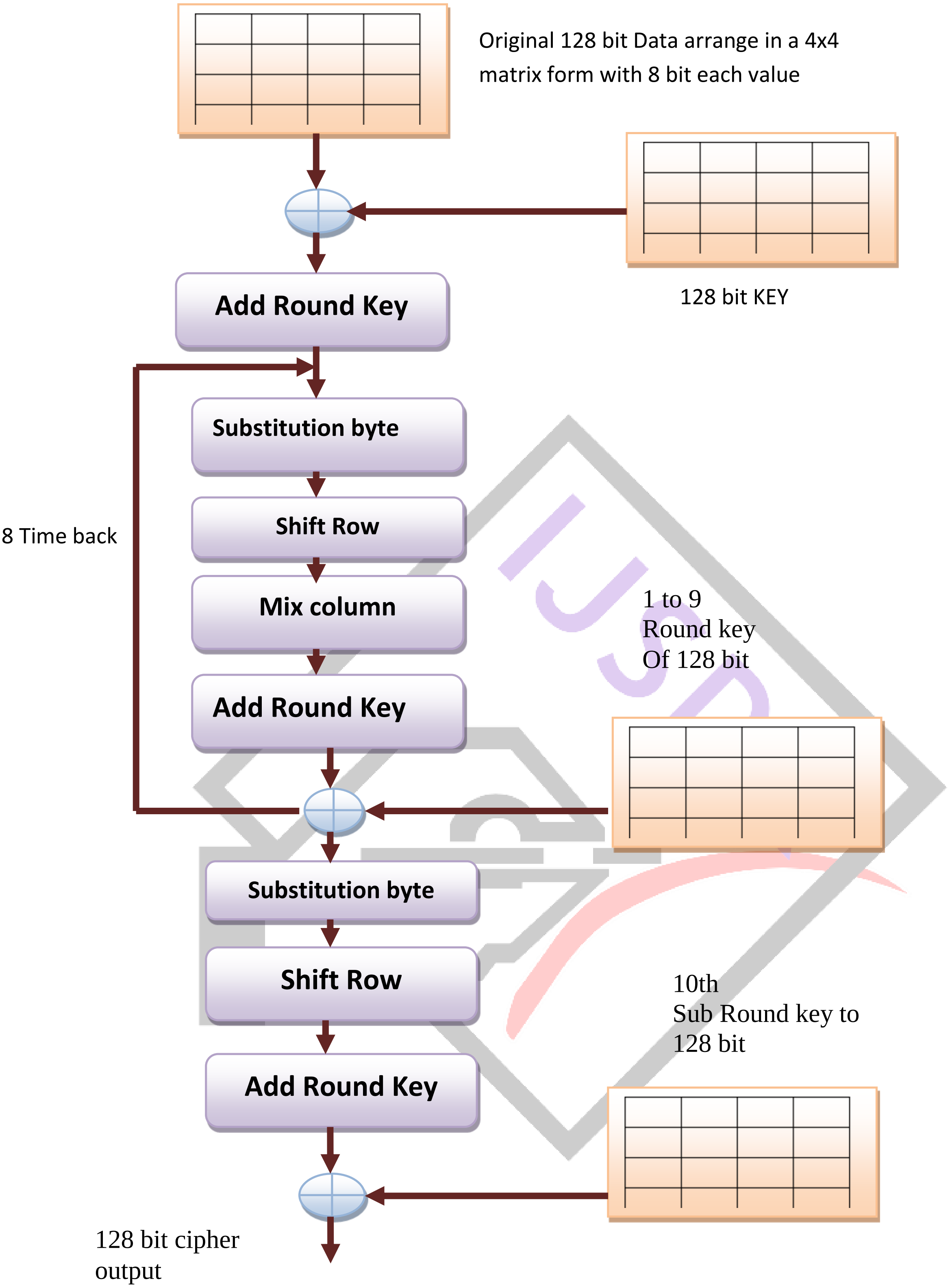
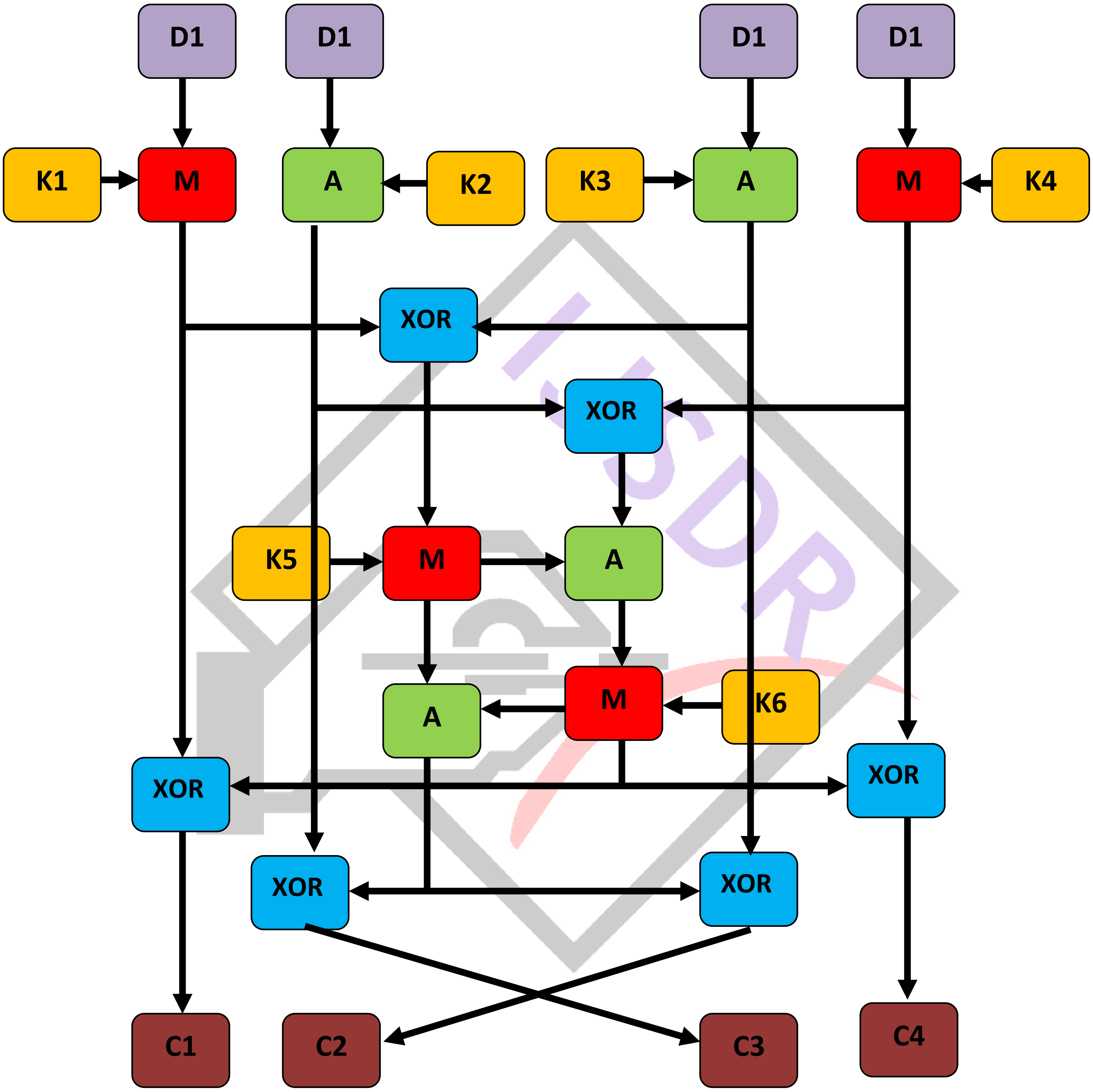


Figure 2 AES Block operations

IV-INTERNATIONAL DATA ENCRYPTION ALGORITHM ENCRYPTION

International Data Encryption Algorithm (IDEA)[6] cryptography serves as a perfect network intrusion detection system (NIDS) tool due to its 128 bits key sizes & high security comparable that to other algorithms. However, to match ever increasing requirement of speed in today's applications, hardware acceleration of cryptographic algorithms is a necessity. As a further challenge, designs have to be robust against side channel attacks. The size of key is fixed to 128 bits & size of data block which may be handled in one encryption/decryption procedure is fixed to 64 bits. All data operations in IDEA[6] cipher are in 16-bit unsigned integers. When processing data which is not an integer multiple to 64-bit block, padding is required. Security of IDEA algorithm [14] is based on mixing to three various kinds to algebraic operations: EX-OR, addition & modular multiplication. IDEA is based upon a basic function, which is iterated eight times. First iteration operates on input 64-bit plain text block & successive iterations operate on 64-bit block from previous iteration. After last iteration, a final transform step produces 64-bit cipher block. Algorithm structure has been chosen such that, with exception that various key sub-blocks are used, encryption procedure is identical to decryption process. IDEA uses both confusion & diffusion to encrypt data. Three algebraic groups, EX-OR, addition modulo 216, & multiplication modulo (2^{16} + 1), are mixed, & they are all easily implemented in both hardware & software. All these operations operate on 16-bit sub-blocks.



M- modulo   A- Adder   K- Key   C-Carry

Figure:-6 IDEA Cipher Generator Module[6]

Figure 6 above shows working flow of IDEA[6] cipher encryption here M is modulo multiplier, ‘A’ is modulo adder K1-K6 are 16 bit part to Key. In each round to 8 rounds to algorithm, following sequences to events [1] are performed:

1. Modulo Multiply D1 & K1
2. Modulo Add D2 & K2

3. Modulo Add D3 & K3
4. Modulo Multiply D4 & K4
5. XOR results to step 1 & step 3
6. XOR results to step 2 & step 4
7. Modulo Multiply results to step 5 with K5
8. Modulo Add results to step 6 & step 7
9. Modulo Multiply results to step 8 with K6
10. Modulo Add results to step 7 & step 9
11. XOR results to step 1 & step 9
12. XOR results to step 3 & step 9
13. XOR results to step 2 & step 10
14. XOR results to step 4 & step 10

Key Generation:-

Original Key = K8 K7 K6 K5 K4 K3 K2 K1
Rotate left by 25 bit = K16 K15 K14 K13 K12 K11 K10 K9
Rotate left by 25 bit = K24 K23 K22 K21 K20 K19 K18 K17
Rotate left by 25 bit = K32 K31 K30 K29 K28 K27 K26 K25
Rotate left by 25 bit = K40 K39 K38 K37 K36 K35 K34 K33
Rotate left by 25 bit = K48 K47 K46 K45 K44 K43 K42 K41
Rotate left by 25 bit = K56 K55 K54 K53 K52 K51 K50 K49
Sub-keys K1-K6 to round two
Sub-keys K7-K12 to round three
Sub-keys K13-K18 to round four
Sub-keys K19-K24 to round five
Sub-keys K25-K30 to round six
Sub-keys K31-K36 to round seven
Sub-keys K37-K42 to round eight
Sub-keys K43-K48 to round nine
Sub-keys K49-K52 to round ten

Every eight complete rounds necessary six sub-keys & final transformation “half round” necessary four sub-keys; so, entire procedure necessary 52 sub-keys. 128-bit key is split into eight 16-bit sub-keys. Then bits are shifted to left 25 bits. Resulting 128-bit string is split into eight 16-bit blocks that become next eight sub-keys shifting & splitting procedure is repeated until 52 sub-keys are generated shifts to 25 bits ensure that repetition does not occur in sub-keys. Six sub-keys are used in each to 8 rounds. Final 4 sub-keys are used in ninth “half round” final transformation. Six 16-bit key sub-blocks from 128-bit key. Since a further four 16-bit key-sub-blocks are required to subsequent output transformation, a total to 52 (= 8 x 6 + 4), First, 128-bit key is partitioned into eight 16-bit sub-blocks which are then directly used as first eight key sub-blocks. 128-bit key is then cyclically shifted to left by 25 positions, after which resulting 128-bit block is again partitioned into eight 16-bit sub-blocks to be directly used as next eight key sub-blocks. cyclic shift procedure described above is repeated until all to require 52 16-bit key sub-blocks have been generated.

V- ADVANTAGE OF IDEA OVER AES METHOD

To encrypt full video is a time taking procedure & necessary many for computation & if we still do that we have to use few supercomputer to encrypt a full video file in real time, various type for video with various frame rate, Intruders always looks as free video hence security level must be very high. P. Deshmukh et al [3] time reduction in encryption & decryption phase is directly proportional to threshold value T. value for T decides how many frames are encrypted using XOR operation with previous frame. They reduce time with significant amount however could not maintain security level they were using easy XOR between selected frames to develop cipher frame. In work by M li et al [2] They were doing AES[3] on almost every 3rd frame which makes their procedure very strong against any attack by intruders however also reduces total time with a big amount & also necessary many for computations.

Haojie Shen et al [1] develop a good procedure as video encryption & they used DCT[1] based frame high & low frequencies pixels isolation & than perform encryption on high frequencies only that make many for change in original videos & develop a video with huge change in output video & make it unrecognisable. They used AES[3] as encryption, problem will be arrive when a video with too many high frequencies their procedure fails because they have to perform Encryption on many pixels which make their procedure slow & dependent on type of video. Second they used AES[3] encryption as we know AES[3] encryption is very good when security concerns however also necessary too many computation S-box & memory element which make AES[3] slower. Propose future work will use IDEA encryption technique instead for AES[3] & using a new formula based Frame pixel finder which rely on KEY given not on type of video.

VI-CONCLUSION

Security scheme which reduces latency overhead by modifying existing approaches as encrypting video data using a probabilistic encryption for frames. the method of video encryption should be useful when we store our confidential video or image on cloud server it so it will be secure we just have to save an encrypted videos & images on cloud servers. it should causes significant speed enhancement for video encryption with similar security. In addition, it should be best suited as communication between hand-held devices such as mobile phones, palmtops etc. algorithm may be used between sites where processing capacity & battery power are limited & efficient encryption is main necessity. video encryption should have lowest SNR among all available work & high MSE than all available work.

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