Design and implementation of high secured crypto core using Humming Bird-2

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Abstract—The main objective of this project is to design a new tool for securing the information in Android Platform. This project based on light weight encryption scheme based on humming bird2. This used to secure the data by making use of password based authentication. The cryptographic key is derived from password based key generation method. Further this project can be extended to latency optimized processor for multipurpose applications. Along with time reduction, security also can be increased by using hybrid approaches in key generation processing. This light weight, latency optimization, more security is the vital key features of this designed crypto device.

Keywords—Humming Bird2, Crypto Core, Latency, Hybrid Approach, Authentication, Key Generation.

I. INTRODUCTION

Authenticated encryption algorithms provide confidentiality and integrity protection for messages using a single processing step. In general, this process is resistant to all previously known Cryptanalytic attacks. This low cost systems for object identification without any physical contact, Tx and Rx communication also have a number of security problems. It's easy for an adversary to obtain sensitive information, since there is no mutual authentication in today's systems. By linking two different sightings of the same Tx and Rx, an adversary can easily trace a person carrying a tagged item. Hummingbird-2 is an authenticating encryption primitive that has been designed particularly for resource-constrained devices such as RFID tags, wireless sensors, smart meters and industrial controllers. Hummingbird-2 can b implemented with very small hardware or software footprint and is therefore suitable for providing security in low-cost ubiquitous devices. The design described in this paper is an evolutionary step from Hummingbird-1 [8, 10, 11] and was developed in part as a response to the cryptanalysis of the cipher presented in [20]. Hummingbird-2 is resistant to all previously known cryptanalytic attacks.

II. LITERATURE SURVEY

ESTREAM initiative [2] was launched as an effort to identify new stream ciphers that might be considered for widespread adoption. Since most known (old) stream ciphers have been the target of (more or less realistic) cryptanalytic attacks, a most important objective of the project was the design of a secure cipher and the derivation of sound (easily checkable) security criteria. Modern cryptography originates in the works of Feistel at IBM during the late 1960's and early 1970's [1]. DES was adopted by the NIST, for encrypting unclassified information in 1977.A 64-bit key is used for encryption of blocks (Seung 1996).The latest specification of AES allows any combination of key lengths i.e. 128, 192, or 256-bit keys and blocks of length 128, 192, or 256-bit. Another milestone happened during 1978, marked by the publication of RSA [2]. The RSA is the first full-fledged public-key algorithm. This discovery by and large solved thekey exchange problem of cryptography. RSA also proposed the world wide acceptable standard techniques like authentication and electronic signatures in modern cryptography. In the 1980s, elliptic curve cryptography (ECC) [6] became popular due to its superior strength per bit compared to existing public key algorithms such as RSA. ECC is able to produce higher security using a key of small size. This superiority of ECC over RSA resulted into effective usage of bandwidth and quick implementation [8].

III. PROPOSED SYSTEM

Hummingbird-2 has been designed to be as lightweight as possible while still maintaining a reasonable security margin against attacks. The state size of 128 bits should not be confused with the state size of stream ciphers. As authenticated encryption process is involved HB-2 provides confidentiality and integrity.

Hummingbird-2 is an encryption algorithm with a 128-bit secret key and a 64-bit initialization vector. Hummingbird-2 optionally produces an authentication tag for each message processed. The structure of the Hummingbird algorithm consists of four 16-bit block ciphers Ek1 ,E k2 ,E k3 and E k4 ,four 16-bit internal state registers RS1,RS2,RS3 and RS4,and a 16-stage LFSR. The secret key is 256-bit which is divided into four 64-bit sub keys ,k1 and k2 ,they can be used in four block ciphers.

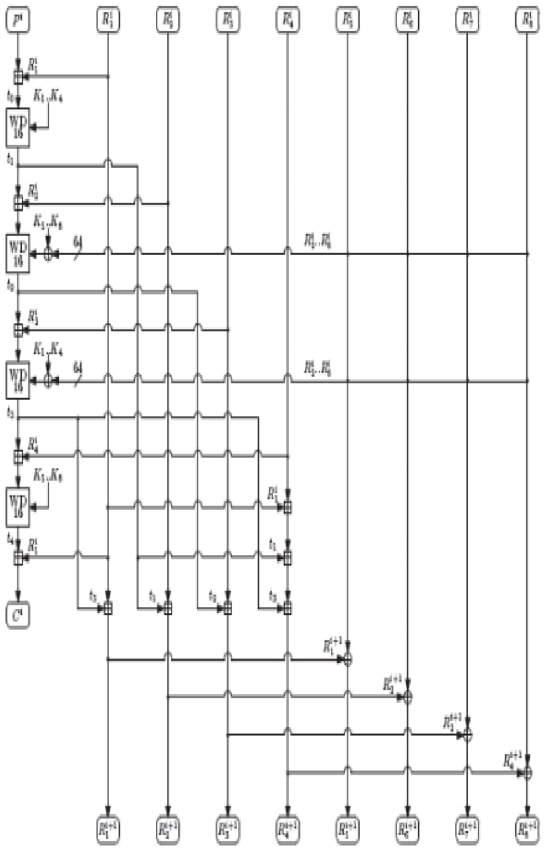

Fig: 1 Encryption architecture

In the encryption process a 16-bit plaintext PT is executed by modulo 2 addition of PT and the first internal state registeRS1.The result of this block is then encrypted by the first block cipher CT .

The Hummingbird-2 cipher has a 128-bit secret key Kand a 128-bit internal state Rwhich is initialized using a 64-bit Initialization Vector IVThese variables are accessed as vectors of 16-bit words:

K = (K 1 ;K2 ;K 3 ;K 4 ;K 5 ;K 6 ;K 7 ;K 8) ;

R= (R 1 ;R 2 ;R 3 ;R4 ;R 5 ;R 6 ;R 7 ;R 8);

IV = (IV 1 ;IV 2 ;IV 3 ;IV 4);

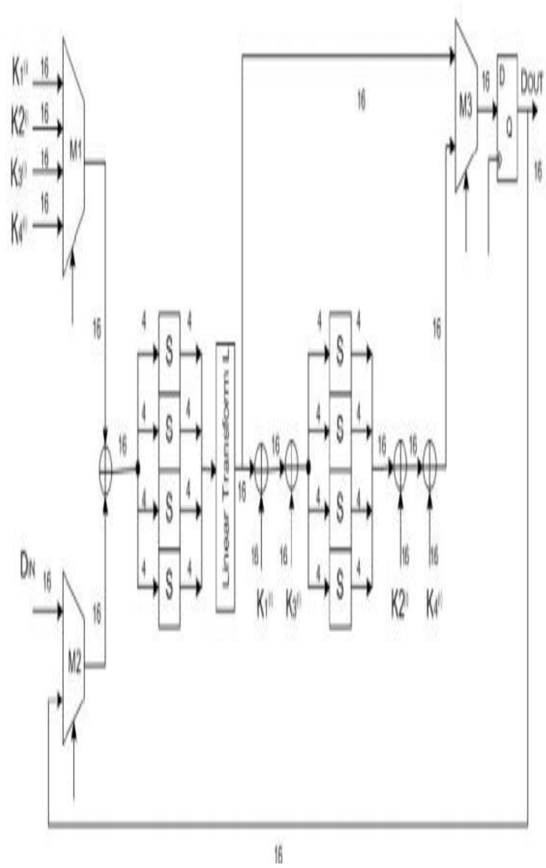

Fig: 2 Round based Architecture

The round-based architecture is Used to further reduce the chip area and power consumption. This architecture repeatedly uses only one round function block as shown in Figure 2 and also consists of four regular rounds which shares the common hardware resources of one substitution and permutation layer and the final round is composed of another substitution layer and four XORs. Therefore, there are totally 5 XORs, 8 S -boxes, and one permutation layer for the data path. Furthermore, three 16-bit multiplexers are introduced for different purposes.

The round-based architecture of the 16-bit block cipher is implemented on the Spartan-3 XC3S200 FPGA. The area requirement of the round-based architecture is tested by four S-boxes and two implementation options, respectively.

IV. IMPLEMENTATION

Xilinx, Inc. (NASDAQ: XLNX) is the world's largest supplier of programmable logic devices, the inventor of the field programmable gate array (FPGA) and the first semiconductor company with a fables manufacturing model

In the Xilinx software we can do simulation and synthesis .The entire processor will be implemented using the Xilinx FPGAs so you won't have to spend time wiring up that part of the circuit. Use a combination of schematics and VHDL to specify a design.

You will, however, have to wire the switches and lights that are used to control the processor, and have to wire the Xilinx part itself to the switches and lights, but this shouldn't be too bad. You will also use the backplane bus in your lab kit so that the Triscuit will be built on two boards: one for the Xilinx chip, and one for the switches and lights.

The HDL Editor feature provides extensive edit and search capabilities with language-specific color coding of keywords, as well as integrated on-line syntax checking to scan Verilog code for errors. The Language Assistant feature speeds design entry by providing a lookup list of typical language constructs and commonly used synthesis modules like counters, accumulators, and adders.

RESULTS ANALYSIS

The proposed design is simulated in XILINX is as shown in figure3

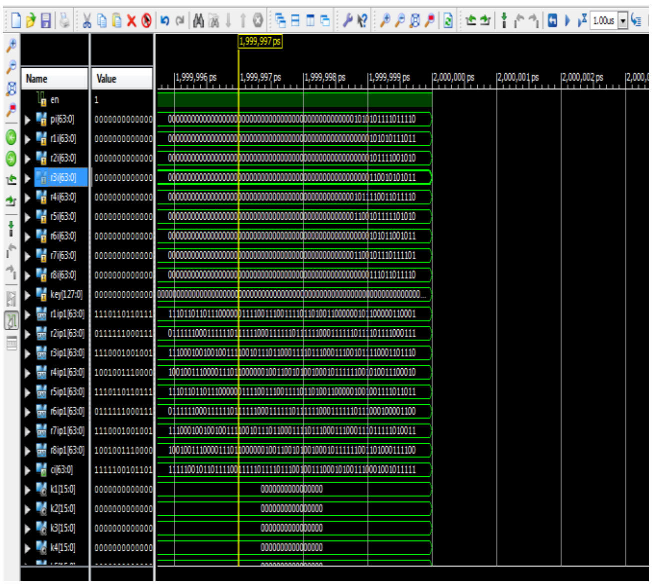

Fig:3 Simulation output for HB-2

V. CONCLUSION:

Finally, this project present a novel cryptanalytic technique called round based humming bird2 algorithm which is especially effective if the differential sequence reflecting parts of a cipher associated with parts of the key can be obtained. The proposed Hummingbird encryption and decryption cores can encrypt and decrypt a 256-bit message block with less number of clock cycles. As compared to other light weight block cipher AES, Hummingbird can encrypt and decrypt in less number of clock cycles.

FUTURE WORK:

As the future research, we intend to conduct further cryptanalysis and security evaluations for Hummingbird cipher as well as propose low power ASIC implementations for low-cost crypto devices.

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