Cryptography

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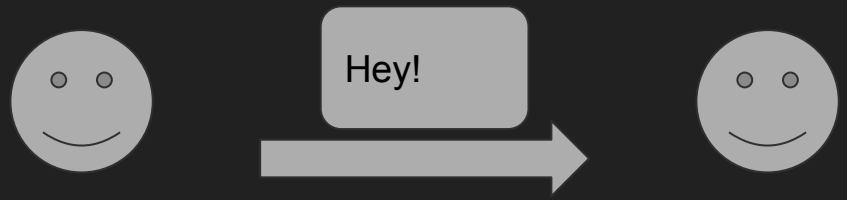
Content

1. Intro
2. (a)symmetric cryptography
3. Hashing
4. Complexity of breaking cipher or hash
5. Several attacks on ciphers
6. Where ciphers are used
7. Conclusion

Encryption

Alice & **B**ob

Mallory & Eve



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Why

1. Data security
2. Verifying the validity of data and its sources
3. Data integrity

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Symmetric Encryption

1. Шифр Цезаря
2. Шифр Виженера
3. Шифр Атбаш
4. Шифр Плайфаера
5. ADFGVX
6. XOR

Шифры основанные на сдвигах, перестановках

7. Шифр Вернама
8. IDEA
9. RC2
10. RC4
11. DES
12. Triple DES
13. Rijndael(AES)

Блочные шифры

XOR

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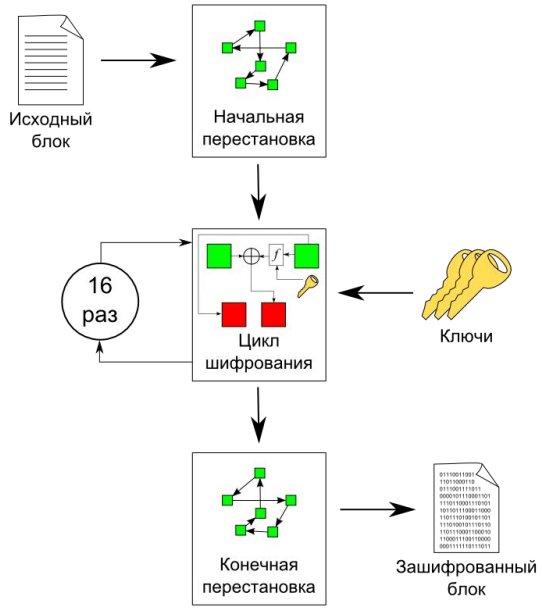
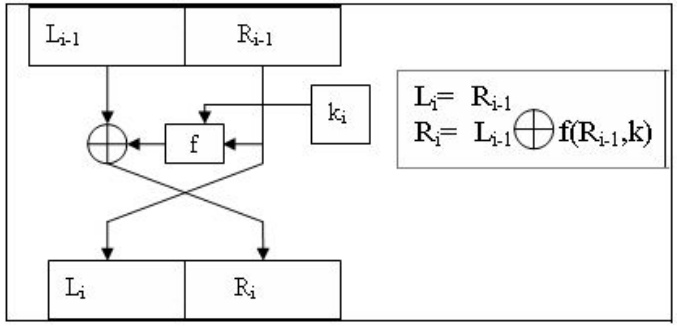
Symmetric Encryption Examples

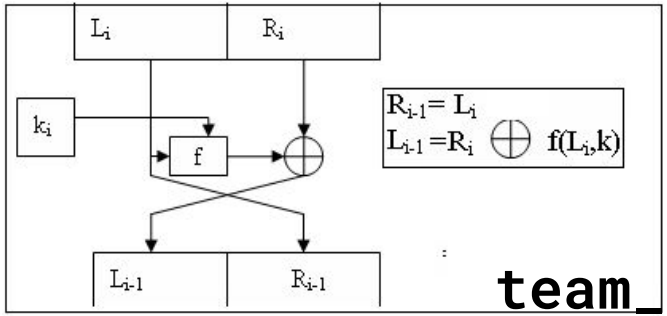
DES



Сеть Фейстеля (прямое преобразование)



Сеть Фейстеля (обратное преобразование)



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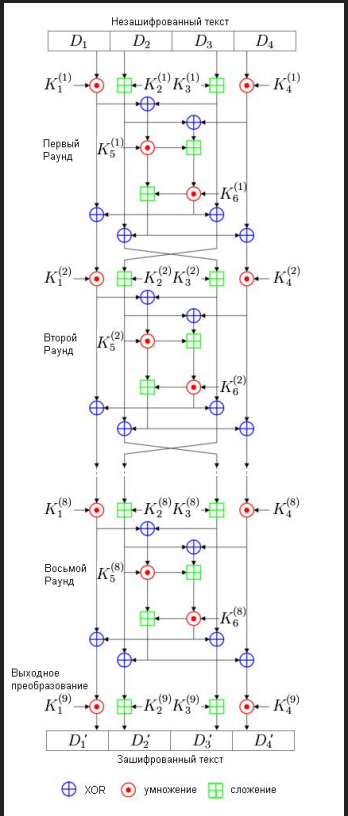
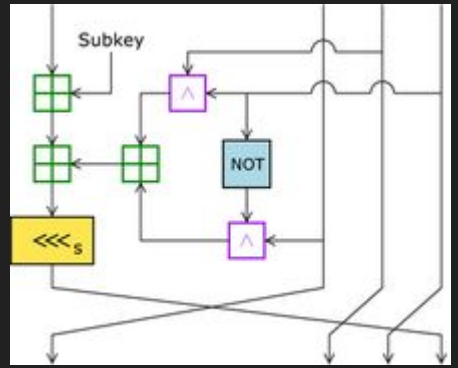
Symmetric Encryption Examples

IDEA



RC2



- быстрее DES
- блочный шифр с длиной блока 64 бита и переменной длиной ключа

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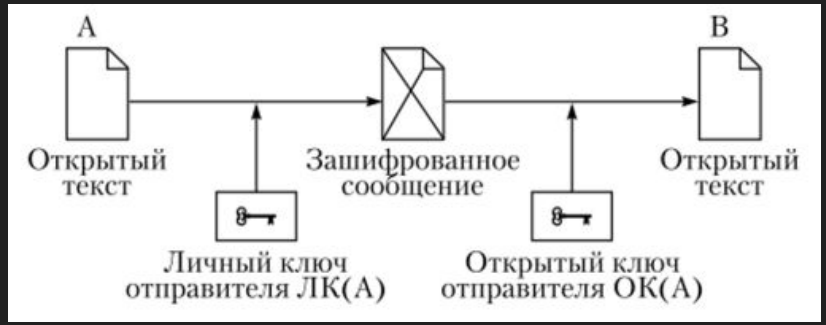
Asymmetric Encryption

1. RSA (Rivest-Shamir-Adleman)
2. DSA (Digital Signature Algorithm)
3. Elgamal (Шифросистема Эль-Гамаля)
4. Diffie-Hellman Protocol
5. ECDSA (Elliptic Curve Digital Signature Algorithm)
6. ГОСТ Р 34.10-2012



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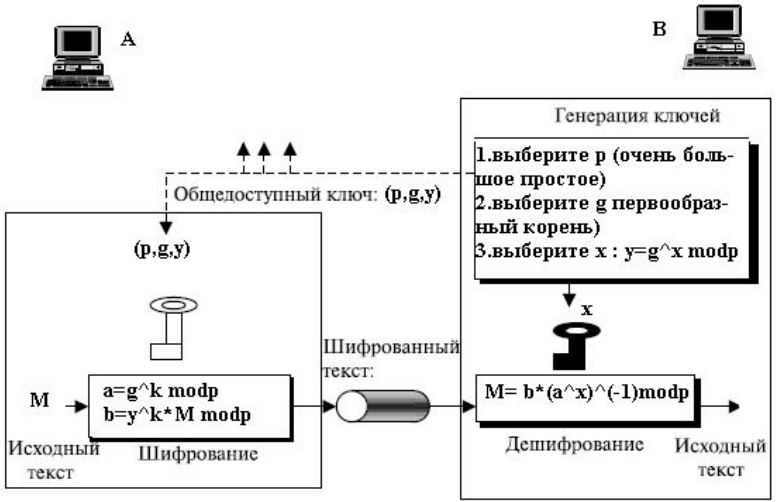
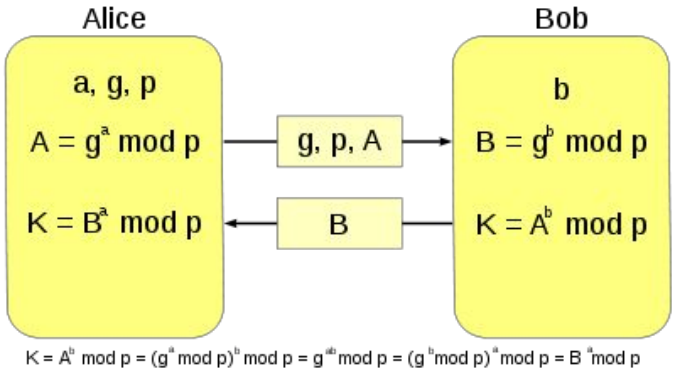
Asymmetric Encryption Examples

Elgamal



Diffie-Hellman



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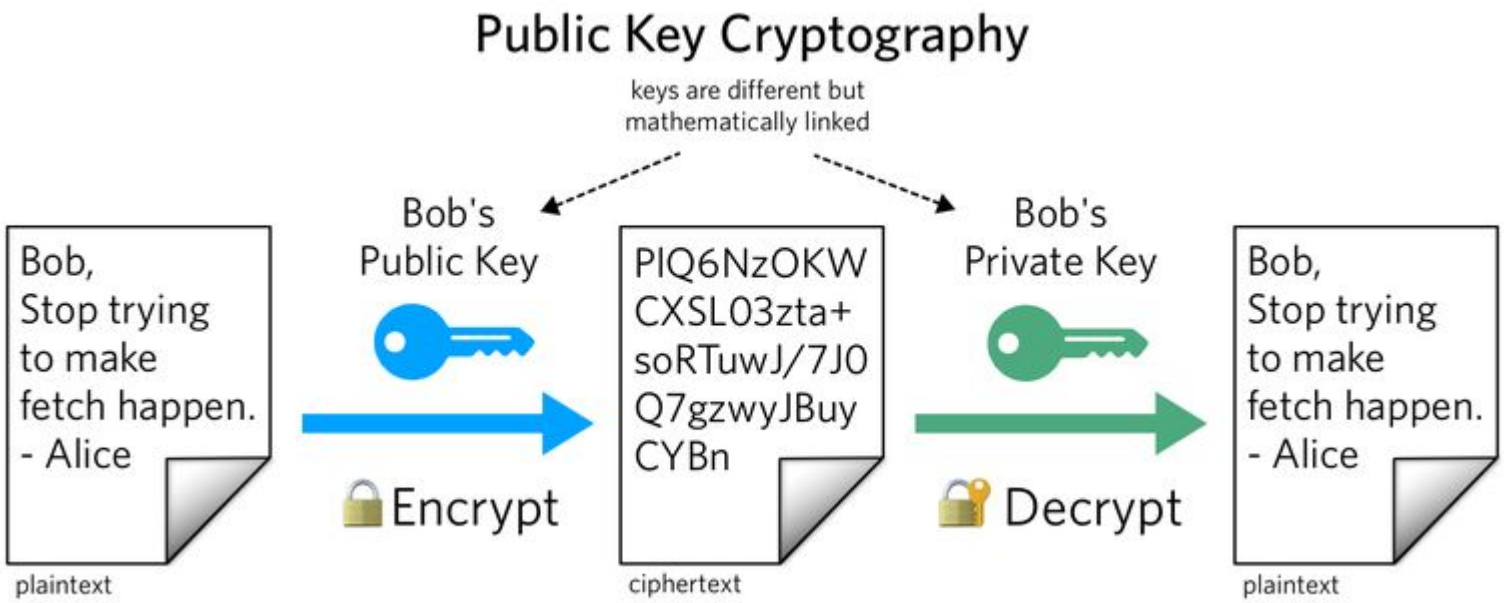
Asymmetric Encryption Examples

RSA



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Hashing

Plain Text

Hashed Text

Привет! → 5797a339206d7d7d5aeb2903d7114867

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Complexity of breaking hash

$$\overbrace{\text{SHA256}}^{\text{Cryptographic hash function}}(\text{“}\underbrace{\qquad\qquad}_{???}\text{”}) = \underbrace{\begin{array}{l}10011111001111000101111001001011\\11011110111011010011011010100101\\01010100010001011110111011010010\\10000101011100101100110011111101\\00111001000111000001011001100001\\00110010101100111110101100100100\\00010101011010001010001000010010\\11000001100001111001001110000100\end{array}}_{\text{Desired output}}$$

$$\left.\begin{array}{l}00000000000000000000000000000000\\00000000000000000000000000000000\\00000000000000000000000000000000\\00000000000000000000000000000000\\00000000000000000000000000000000\\00000000000000000000000000000000\\00000000000000000000000000000000\\00000000000000000000000110001110\end{array}\right\} 2^{256} \text{ possibilities}$$

youtu.be/watch?v=S9JGmA5_unY

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Complexity of breaking cipher

Задача дискретного логарифмирования

$$a^x = b(mod\ m),$$

где a и m известны и взаимно просты (не имеют общих делителей), b также известно.

https://e-maxx.ru/algo/discrete_log

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Several attacks on ciphers

Attack:	Defence:
Man In The Middle	Holding Hands Protocol
Bruteforce	Complex dictionary

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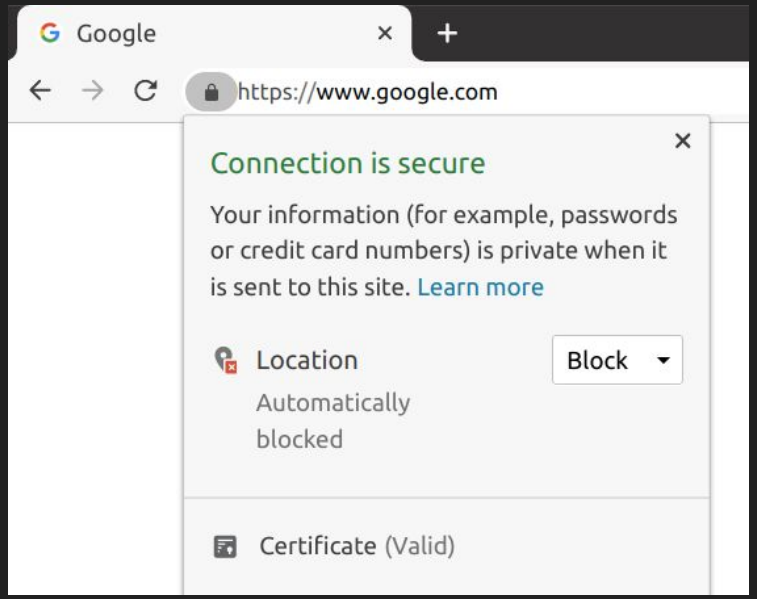
Where ciphers are used



Mobile Networks

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Tools for CTF tasks

https://github.com/Ciphey/Ciphey

https://gchq.github.io/CyberChef/

https://github.com/Ganapati/RsaCtfTool/blob/master/RsaCtfTool.py

Sources

Book

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github.com/ilyas-mspv

Questions?

End-to-end Encryption

1.