Cryptography

Run by Pranav Goel

What is Cryptography

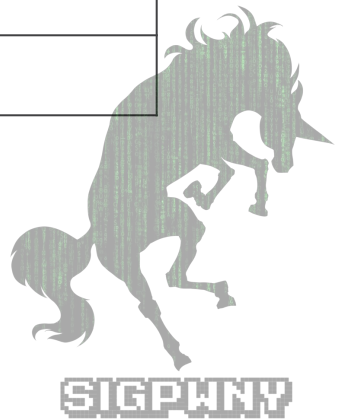
- Transforming Data

XOR

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

Associative: if A ^ B = C, B ^ A = C
Reversible: if A ^ B = C, C ^ B = A

(Super secret): if A ^ B = C, A ^ C = B



What is Keyed Xor

- Each bit is xored with the key
- The unique property of keyed xor is that the same key can be used to decode the cipher.
- Repeated key encryption: if key runs out, start at the beginning of the key again

XOR You Ready? - From the Fall Hackathon

XOR Key: "Flip those bits!"

Encrypted String: '
\x00\x08\x17[2\x04\x06\x03\x15I\x16\x10T\x15M)\x1c\x14'

Link: XOR You Ready?

XOR you ready? - From the Fall Hackathon

- Cipher is in hex with the “/” so you need to convert them into something that is much more useable
- XOR that with the key and make sure the result is in ASCII

RSA

- The Algorithm
  - p, q: **very large prime numbers, private**
  - n = p*q: **public modulus**
  - t = (p-1)*(q-1): **totient, private**
  - e = 65537: **public exponent, coprime to the totient, used for encryption**
  - d ≡ e^−1 (mod t): **private exponent, used for decryption**
  - Public key components: n, e
  - Private key components: p, q, d, n, e
- Encrypting the message (m) to get the ciphertext (c)
  - c = m^e (mod n)
- Decrypting
  - m = c^d (mod n)

RSA

- The bigger the n the more secure it is
- How can we start breaking it?
  - Since n = p * q where p * q should be the only prime factors of n we can try decomposing n
  - You can write a program or use factordb
  - Factordb is a website that factorizes large numbers
  - Once you have p and q it becomes very easy decrypt!

The Unbreakable RSA - From Fall Hackathon

- What do we have?
- What do we we need to decrypt the message?
- Challenge: The Unbreakable RSA