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Welcome to this session:
Cryptography

The session will start shortly...

Questions? Drop them in the chat.
We'll have dedicated moderators
answering questions.

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What is Safeguarding?

Safeguarding refers to actions and measures aimed at protecting the human rights of adults, particularly vulnerable individuals, from abuse, neglect, and harm.

To report a safeguarding concern reach out to us via email:
safeguarding@hyperiondev.com

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Live Lecture Housekeeping:

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly.
- No question is daft or silly - ask them!
- For all non-academic questions, please submit a query: www.hyperiondev.com/support
- If you are hearing impaired, please kindly use your computer's function through Google chrome to enable captions.

Stay Safe Series:

Mastering Online Safety One Week/step at a Time

While the digital world can be a wonderful place to make education and learning accessible to all, it is unfortunately also a space where harmful threats like online radicalisation, extremist propaganda, phishing scams, online blackmail and hackers can flourish.

As a component of this BootCamp the *Stay Safe Series* will/is designed to guide you through essential measures in order to protect yourself & your community from online dangers, whether they target your privacy, personal information or even attempt to manipulate your beliefs.

Download with Caution: Avoiding Dangerous Files

- Use Trusted Sources Only
- Look for HTTPS
- Avoid Clicking on Pop-ups
- Scan Downloads with Antivirus
- Keep Software Updated
- Beware of Free Downloads
- Check File Extensions

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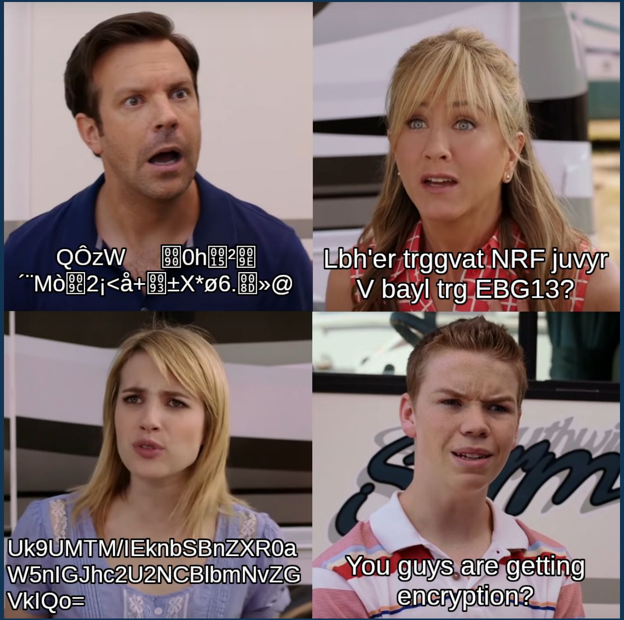
Cryptography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You guys are getting encryption?

Learning Outcomes

- Define Cryptography
- Identify the Purposes of Cryptography
- Understand Key Cryptographic Concepts such as encryption, decryption, and hashing
- Recognise Real-World Applications of Cryptography

Software Engineering

What are some reasons to want to hide information or data?

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What is Cryptography?

Cryptography is the process of hiding or coding information so only the person who the message was intended for can read it.

Why do we use Cryptography?

- Privacy and Confidentiality
- Authentication
- Non-repudiation

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Encryption

- Process of changing data, through mathematical processes, making it unreadable. The data can only be changed back by someone who has the correct key.

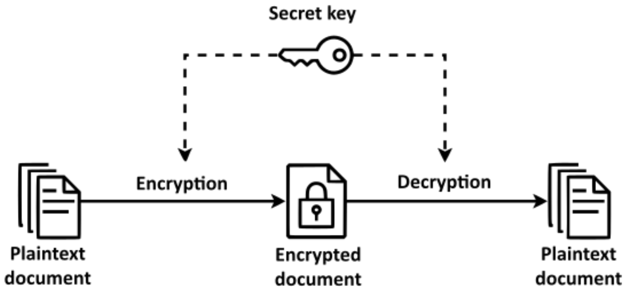
Encryption can be divided in 2 categories:

- Symmetrical
  - Uses the same key for both encryption and decryption
- Asymmetrical
  - Uses a private/public key pair for encryption and decryption.

Symmetrical Encryption

- Symmetrical encryption uses the same key for both encryption and decryption.

- **User A** encrypts a message using a key.
- **User A** can now send the encrypted message to **User B**
- **User B** can then use the key to decrypt the message and read it.



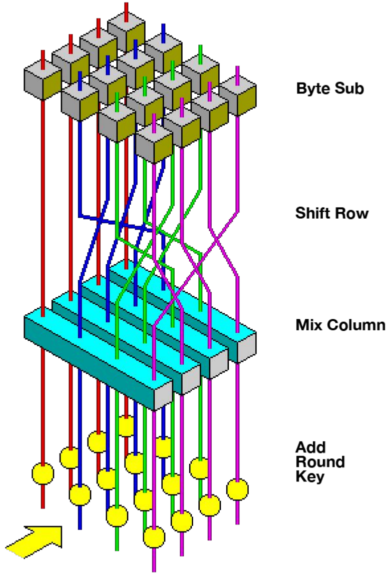
Advanced Encryption standard

- Block cipher used by the US government to protect classified information.
- Split the message into smaller blocks of 128 bits each.
- Uses same key to encrypt and decrypt.

Advanced Encryption standard

Transformation Stages

- 1: Involves data substitution with a predefined cipher and a substitution table.
- 2: Data rows get shifted except for the first row.
- 3: Uses the Hill cipher to mix columns.
- 4: Block of data uses a small portion of the encryption key.



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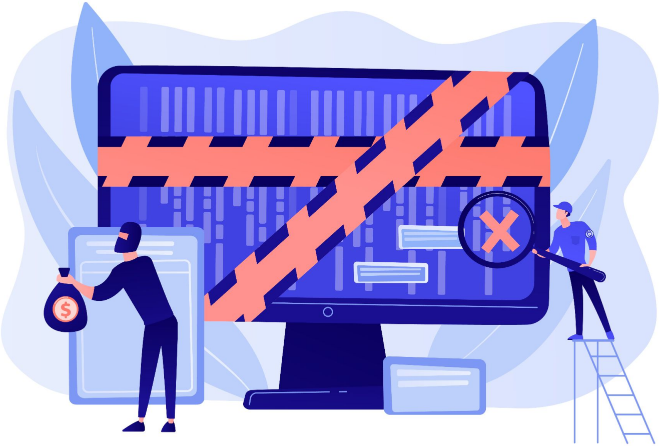
Advantages of AES

- Security
- Cost
- Implementation

AES Vulnerabilities

- Incorrect configuration.
- Not enough encryption rounds.
- Side channel attacks.

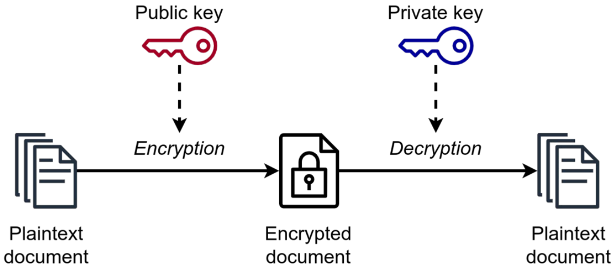


Asymmetrical Encryption

- Uses a private/public key pair for encryption and decryption.

User A wants to send a message to User B

- **User A** encrypts a message using **User B**'s public key.
- **User A** can now send the encrypted message to **User B**
- **User B** can then use their private key to decrypt the message and read it.

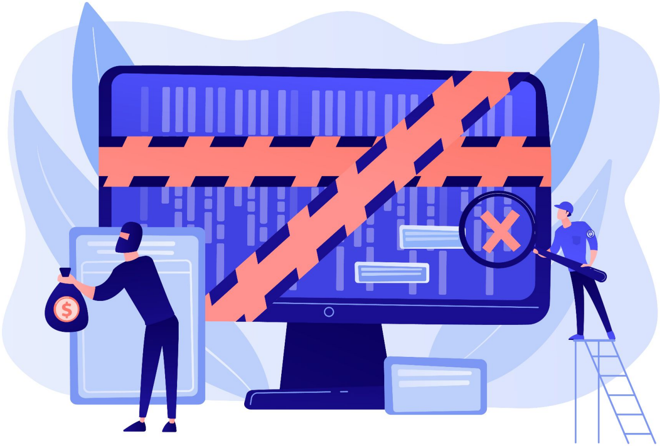


Rivest Shamir Adleman (RSA)

- Protects data through encryption and decryption with private and public keys.
- Most widely used encryption mechanism in the world.
- Uses 2 very large prime numbers and performs a sequence of steps to produce a private and public key set that can be used.

Vulnerabilities

- Key sizes
- Future technology
- Side channel attacks
- Weak Random Number Generators



Use Cases

- Digital Signatures
- Digital Certificates
- Secure Communication Protocols

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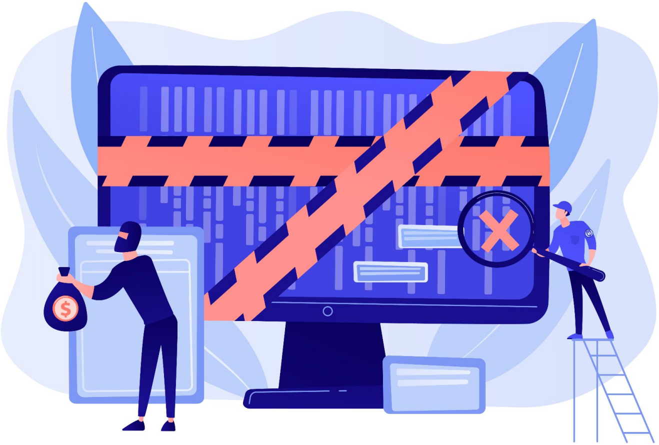
Keys and Key Management

Keys are at the centre point of our cryptography and protecting them should be off highest priority.

Vulnerabilities

- Weak keys
- Overused keys
- Using keys for multiple purposes
- Keys stored alongside Data
- Insider threats



Mitigating Risks

- We can mitigate risks using a key management system.

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Consequences of Key Leaks

- Investigation costs
- Loss of sensitive data
- Financial losses
- Fines
- Reputational damage
- Some cases the business closes.

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Hashing

- Hashing is the process of changing data into a fixed size string value called a hash.

Benefits

- Data retrieval
- Digital Certificates
- Password storing

Disadvantages

- Risk of collisions.
- Very difficult to reverse.
- Not very friendly with data that requires sorting.

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Cryptography

How would life change if cryptography didn't exist?

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Polls

Please have a look at the poll notification and select an option.

What is the primary purpose of cryptography?

A. Data compression
B. Data protection
C. Data deletion
D. Data sorting

Polls

Please have a look at the poll notification and select an option.

What type of key pair is used in asymmetric cryptography?

A. Two public keys
B. Two private keys
C. A public key and a private key
D. No key is required

Q & A SECTION

Please use this time to ask any questions relating to the topic, should you have any.

Thank you for attending

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