Cybersecurity Internship

Introduction:

This report summarizes what I have learned during my cybersecurity internship at BabiVision. Throughout this phase, I explored key cybersecurity fundamentals, experimented with Python code demos, and performed some basic network tests on my computer. The goal was to build a strong foundation for future hands-on practice.

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1-CIA Triad Documentation

The CIA Triad is the foundation of cybersecurity:

Confidentiality: Prevent unauthorized access.
Example: Passwords are encrypted so employees cannot read them.

Integrity: Ensure data is not altered.
Example: If you transfer $100, it doesn't have to become $50; the number has to remain the same.

Availability: Ensure systems are available.
Example: Bank websites use backup servers to stay online.

2-Symmetric Encryption (Theory + Demo)

Symmetric encryption uses one shared key for encryption and decryption.
Common algorithms: AES, DES/3DES, Blowfish, ChaCha20

Python Demo (AES):

```python
from Crypto.Cipher import AES
from Crypto.Random import get_random_bytes
import base64

key = get_random_bytes(16)
cipher = AES.new(key, AES.MODE_EAX)
message = b'Hello Cybersecurity!'
nonce = cipher.nonce
ciphertext, tag = cipher.encrypt_and_digest(message)
print('Ciphertext:', base64.b64encode(ciphertext).decode())

cipher_dec = AES.new(key, AES.MODE_EAX, nonce=nonce)
plaintext = cipher_dec.decrypt(ciphertext)
print('Decrypted:', plaintext.decode())
```

3-Asymmetric Encryption (Theory + Demo)

Asymmetric encryption uses a key pair: Public key to encrypt, Private key to decrypt.
Common algorithms: RSA, ECC

Python Demo (RSA):

```python
from cryptography.hazmat.primitives.asymmetric import rsa, padding
from cryptography.hazmat.primitives import hashes

private_key = rsa.generate_private_key(public_exponent=65537, key_size=2048)
public_key = private_key.public_key()

message = b'Hello Asymmetric!'
ciphertext = public_key.encrypt(
    message,
    padding.OAEP(
        mgf=padding.MGF1(algorithm=hashes.SHA256()),
        algorithm=hashes.SHA256(),
        label=None
    )
)

plaintext = private_key.decrypt(
    ciphertext,
    padding.OAEP(
        mgf=padding.MGF1(algorithm=hashes.SHA256()),
        algorithm=hashes.SHA256(),
        label=None
    )
)

print('Encrypted:', ciphertext)
print('Decrypted:', plaintext.decode())
```

4-Digital Signatures

Digital signatures provide integrity and authentication.
The sender signs with the private key and the receiver verifies with the public key.

Python Demo:

```python
from Crypto.PublicKey import RSA
from Crypto.Signature import pkcs1_15
from Crypto.Hash import SHA256

key = RSA.generate(2048)
private_key = key
public_key = key.publickey()

message = b'Verify me!'
hash_obj = SHA256.new(message)
signature = pkcs1_15.new(private_key).sign(hash_obj)

try:
    pkcs1_15.new(public_key).verify(hash_obj, signature)
    print('Signature is valid.')
except (ValueError, TypeError):
    print('Signature is invalid.')
```

5-Network Security Basics

Firewalls: Control traffic between internal networks and the Internet.
VPN: Encrypts traffic and hides IP address.
HTTPS: Encrypts communication between browser and server.
Port Scanning: Checks open ports (e.g., Nmap).

Example commands:

```
ping google.com
nmap scanme.nmap.org
```

Summary

The CIA Triad is the foundation of security.
Symmetric and asymmetric encryption protect confidentiality.
Digital signatures ensure integrity and authentication.
Network security tools like firewalls, VPNs, and HTTPS protect data in transit.
Together, they form a secure system.

6-Cyber Hygiene Poster (Bonus)

5 Essential Tips for Staying Safe Online:

1. Use strong, unique passwords.
2. Enable Two-Factor Authentication (2FA).
3. Avoid clicking suspicious links or attachments.
4. Keep your software and antivirus updated.
5. Regularly back up important data.

Personal Reflection

Working on this report helped me understand cybersecurity concepts more deeply. I enjoyed running the code samples and seeing encryption and signatures work in practice.