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Second Network Programming Homework

Question 1: Bank ATM Application with TCP Server/Client and Multi-threading

Project Description:

Build a TCP server and client Bank ATM application using Python. The server should handle multiple client connections simultaneously using multi-threading. The application should allow clients to connect, perform banking operations (such as check balance, deposit, and withdraw), and receive their updated account status upon completion.

Requirements:

A. The server should be able to handle multiple client connections concurrently.
B. The server should maintain a set of pre-defined bank accounts with balances.
C. Each client should connect to the server and authenticate with their account details.
D. Clients should be able to perform banking operations: check balance, deposit money, and withdraw money.
E. The server should keep track of the account balances for each client.
F. At the end of the session, the server should send the final account balance to each client.

Guidelines:

- Use Python's socket module without third-party packages.
- Implement multi-threading to handle multiple client connections concurrently.
- Store the account details and balances on the server side.

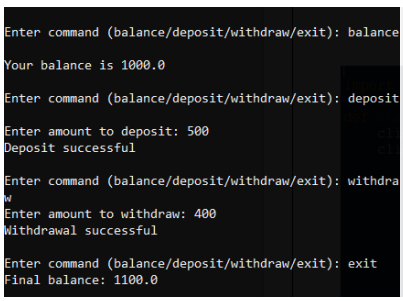
Notes:

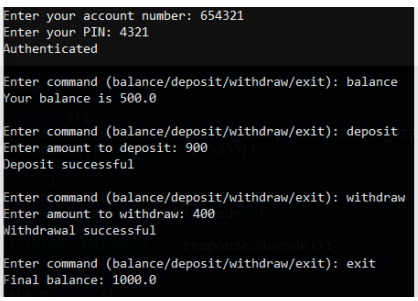
- Write a brief report describing the design choices you made and any challenges faced during implementation.
- You can choose to create a TCP Server/Client Bank ATM application or any other appropriate application that fulfills all requirements

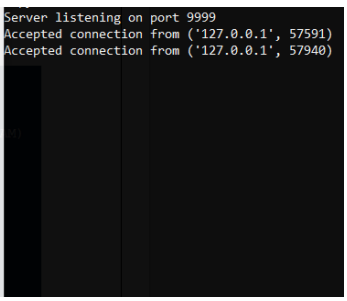
```python
import socket
import threading

# Pre-defined bank accounts
accounts = {
    '123456': {'pin': '1234', 'balance': 1000.0},
    '654321': {'pin': '4321', 'balance': 500.0}
}

# Function to handle client connections
def handle_client(client_socket):
    try:
        client_socket.send(b"Enter your account number: ")
        account_number = client_socket.recv(1024).decode().strip()

        client_socket.send(b"Enter your PIN: ")
        pin = client_socket.recv(1024).decode().strip()

        if account_number in accounts and accounts[account_number]['pin'] == pin:
            client_socket.send(b"Authenticated\n")
            while True:
                client_socket.send(b"Enter command (balance/deposit/withdraw/exit): ")
                command = client_socket.recv(1024).decode().strip()

                if command == 'balance':
                    balance = accounts[account_number]['balance']
                    client_socket.send(f"Your balance is {balance}\n".encode())

                elif command == 'deposit':
                    client_socket.send(b"Enter amount to deposit: ")
                    amount = float(client_socket.recv(1024).decode().strip())
                    accounts[account_number]['balance'] += amount
                    client_socket.send(b"Deposit successful\n")

                elif command == 'withdraw':
                    client_socket.send(b"Enter amount to withdraw: ")
                    amount = float(client_socket.recv(1024).decode().strip())
                    if amount <= accounts[account_number]['balance']:
                        accounts[account_number]['balance'] -= amount
                        client_socket.send(b"Withdrawal successful\n")
                    else:
                        client_socket.send(b"Insufficient funds\n")

                elif command == 'exit':
                    balance = accounts[account_number]['balance']
                    client_socket.send(f"Final balance: {balance}\n".encode())
                    break
                else:
                    client_socket.send(b"Invalid command\n")
        else:
            client_socket.send(b"Authentication failed\n")
    finally:
        client_socket.close()
```

```python
# Main server function
def start_server():
    server = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    server.bind(('0.0.0.0', 9999))
    server.listen(5)
    print("Server listening on port 9999")

    while True:
        client_socket, addr = server.accept()
        print(f"Accepted connection from {addr}")
        client_handler = threading.Thread(target=handle_client, args=(client_socket,))
        client_handler.start()

if __name__ == "__main__":
    start_server()
```

```python
import socket

def start_client():
    client = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    client.connect(('127.0.0.1', 9999))

    while True:
        response = client.recv(1024)
        print(response.decode(), end='')

        if 'Final balance' in response.decode():
            break

        data = input()
        client.send(data.encode())

    client.close()

if __name__ == "__main__":
    start_client()
```







السؤال الأول:

السيرفر:

البرنامج ينشئ خادم بنكي باستخدام مكتبة socket و threading الخيوط في بايثون، مع حسابات بنكية محددة مسبقًا تحتوي على أرقام حسابات، أرقام تعريف شخصية (PIN) وأرصدة.

عند اتصال عميل بالخادم، يتم إرسال طلبات لإدخال رقم الحساب وPIN. إذا كانت المصادقة ناجحة، يتم منح العميل الوصول إلى العمليات البنكية التالية:

- التحقق من الرصيد عن طريق إرسال أمر "balance"، حيث يتم إرجاع الرصيد الحالي.

- الإيداع عن طريق إرسال أمر "deposit"، ثم المبلغ المراد إيداعه، حيث يتم إضافة المبلغ إلى الرصيد الحالي وإعلام العميل بنجاح العملية.

- السحب عن طريق إرسال أمر "withdraw"، ثم المبلغ المراد سحبه، حيث يتم التحقق من توفر الرصيد الكافي. إذا كان الرصيد كافيًا، يتم خصم المبلغ وإعلام العميل بنجاح العملية، وإلا يتم إخباره بنقص الرصيد.

- إنهاء الجلسة عن طريق إرسال أمر "exit"، حيث يتم إرسال الرصيد النهائي للعميل قبل إنهاء الاتصال.

إذا فشلت المصادقة، يتم إبلاغ العميل بفشل العملية وإغلاق الاتصال. يتم تشغيل الخادم في الدالة الرئيسية، حيث يتم إعداد مقبس الشبكة وربطه بعنوان IP والمنفذ المحددين. يبدأ الخادم بالاستماع لطلبات الاتصال، وعند قبول اتصال جديد، يتم إنشاء خيط جديد للتعامل مع طلبات العميل، مما يسمح بالتعامل مع عدة عملاء في نفس الوقت.

العميل:

البرنامج ينشئ عميلًا للاتصال بخادم بنكي باستخدام مكتبة الشبكات في بايثون. يبدأ العميل بإنشاء مقبس شبكة والاتصال بالخادم على العنوان المحلي والمنفذ 9999. يستقبل العميل البيانات من الخادم ويعرضها للمستخدم، ثم ينتظر إدخال المستخدم ويرسل البيانات المدخلة إلى الخادم. تستمر هذه العملية حتى يتلقى العميل رسالة تحتوي على "Final balance"، وعندها يغلق الاتصال بالخادم وينهي البرنامج.

Question 2: Simple Website Project with Python Flask Framework (you have choice to use Django or any Other Deferent Useful Python Project "from provide Project Links")

Create a simple website with multiple pages using Flask, HTML, CSS, and Bootstrap. The website should demonstrate your understanding of web design principles .
Requirements :

G. Set up a local web server using XAMPP, IIS, or Python's built-in server (using Flask) .
H. Apply CSS and Bootstrap to style the website and make it visually appealing .
I. Ensure that the website is responsive and displays correctly on different screen sizes .
J. Implement basic server-side functionality using Flask to handle website features .

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Learn Cybersecurity - From Beginner to Pro</title>
    <link rel="stylesheet" href="{{ url_for('static', filename='css/bootstrap.min.css') }}">
    <link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
</head>
<body>
    <header>
        <nav class="navbar navbar-expand-lg navbar-light bg-light">
            <a class="navbar-brand" href="{{ url_for('index') }}">Cybersecurity</a>
            <button class="navbar-toggler" type="button" data-toggle="collapse" data-target="#navbarNav" aria-controls="navbarNav" aria-expanded="false"
                aria-label="Toggle navigation">
                <span class="navbar-toggler-icon"></span>
            </button>
            <div class="collapse navbar-collapse" id="navbarNav">
                <ul class="navbar-nav">
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('index') }}">Home</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('about') }}">About</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('contact') }}">Contact</a>
                    </li>
                </ul>
            </div>
        </nav>
    </header>
```

```
    </header>
    <div class="container mt-5">
        <section>
            <h2>Learning Steps</h2>
            <ol>
                <li>Get familiar with basic networking concepts</li>
                <li>Learn about common cyber threats and attack vectors</li>
                <li>Understand different types of malware and their behaviors</li>
                <li>Explore encryption and cryptographic protocols</li>
                <li>Study secure coding practices and web application security</li>
                <li>Master network security, firewalls, and intrusion detection systems</li>
                <li>Learn about vulnerability assessment and penetration testing</li>
                <li>Stay updated with the latest security trends and techniques</li>
            </ol>
        </section>
        <section>
            <h2>Certifications</h2>
            <ul>
                <li>CompTIA Security+</li>
                <li>Certified Ethical Hacker (CEH)</li>
                <li>GIAC Security Essentials (GSEC)</li>
                <li>Certified Information Systems Security Professional (CISSP)</li>
                <li>Offensive Security Certified Professional (OSCP)</li>
                <li>Certified Information Security Manager (CISM)</li>
                <li>Certified Information Systems Auditor (CISA)</li>
            </ul>
        </section>
        <section>
            <h2>Levels</h2>
            <ul>
                <li>Beginner</li>
                <li>Intermediate</li>
                <li>Advanced</li>
                <li>Expert</li>
            </ul>
        </section>
    </div>
```

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>About - Cybersecurity</title>
    <link rel="stylesheet" href="{{ url_for('static', filename='css/bootstrap.min.css') }}">
    <link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
</head>
<body>
    <header>
        <nav class="navbar navbar-expand-lg navbar-light bg-light">
            <a class="navbar-brand" href="{{ url_for('index') }}">Cybersecurity</a>
            <button class="navbar-toggler" type="button" data-toggle="collapse" data-target="#navbarNav" aria-controls="navbarNav" aria-expanded="false"
                aria-label="Toggle navigation">
                <span class="navbar-toggler-icon"></span>
            </button>
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                <ul class="navbar-nav">
                    <li class="nav-item">
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                    </li>
                    <li class="nav-item">
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                    </li>
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('contact') }}">Contact</a>
                    </li>
                </ul>
            </div>
        </nav>
    </header>
            </div>
        </nav>
    </header>

    <div class="container mt-5">
        <section>
            <h2>About Us</h2>
            <p>Welcome to Learn Cybersecurity, your ultimate resource for mastering the art of securing digital systems and data. We are passionate about
                providing high-quality cybersecurity education to empower individuals and organizations in protecting against cyber threats.</p>
            <p>Our team of experienced cybersecurity professionals has curated comprehensive learning materials and practical exercises to guide you through
                the journey of becoming a cybersecurity expert. Whether you're a beginner or an advanced practitioner, our courses and resources cater to all
                skill levels.</p>
        </section>

        <section>
            <h2>Our Mission</h2>
            <p>At Learn Cybersecurity, our mission is to equip individuals with the knowledge and skills necessary to defend against cyber attacks and
                contribute to a safer digital world. We strive to make cybersecurity education accessible and engaging, fostering a community of lifelong
                learners dedicated to strengthening the security posture of organizations worldwide.</p>
        </section>

        <section>
            <h2>Why Choose Us?</h2>
            <ul>
                <li>Comprehensive curriculum covering a wide range of cybersecurity topics</li>
                <li>Hands-on learning with practical exercises and real-world scenarios</li>
                <li>Experienced instructors with extensive industry knowledge</li>
                <li>Flexible learning options to fit your schedule and learning style</li>
                <li>Interactive community forums for collaboration and knowledge sharing</li>
                <li>Opportunities for earning industry-recognized certifications</li>
            </ul>
        </section>
    </div>

</body>
</html>
```

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Contact - Cybersecurity</title>
    <link rel="stylesheet" href="{{ url_for('static', filename='css/bootstrap.min.css') }}">
    <link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
</head>
<body>
    <header>
        <nav class="navbar navbar-expand-lg navbar-light bg-light">
            <a class="navbar-brand" href="{{ url_for('index') }}">Cybersecurity</a>
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            </button>
            <div class="collapse navbar-collapse" id="navbarNav">
                <ul class="navbar-nav">
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('index') }}">Home</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('about') }}">About</a>
                    </li>
                    <li class="nav-item">
                        <a class="nav-link" href="{{ url_for('contact') }}">Contact</a>
                    </li>
                </ul>
            </div>
        </nav>
    </header>
```

```
    <div class="container mt-5">
        <section>
            <h2>Contact Us</h2>
            <p>Have a question or need assistance? Feel free to reach out to our team. We are here to help!</p>

            <form>
                <div class="form-group">
                    <label for="name">Name:</label>
                    <input type="text" id="name" name="name" class="form-control" required>
                </div>
                <div class="form-group">
                    <label for="email">Email:</label>
                    <input type="email" id="email" name="email" class="form-control" required>
                </div>
                <div class="form-group">
                    <label for="message">Message:</label>
                    <textarea id="message" name="message" class="form-control" rows="5" required></textarea>
                </div>
                <button type="submit" class="btn btn-primary">Send</button>
            </form>
        </section>

        <section class="mt-5">
            <h2>Our Location</h2>
            <p>Learn Cybersecurity is located at:</p>
            <address>
                123 Cybersecurity Street<br>
                City, State, ZIP<br>
                Country
            </address>
        </section>
    </div>

    <script src="{{ url_for('static', filename='js/jquery-3.2.1.slim.min.js') }}"></script>
    <script src="{{ url_for('static', filename='js/popper.min.js') }}"></script>
    <script src="{{ url_for('static', filename='js/bootstrap.min.js') }}"></script>
</body>
</html>
```

```python
from flask import Flask, render_template

app = Flask(__name__)

@app.route('/')
def index():
    return render_template('index.html')

@app.route('/about')
def about():
    return render_template('about.html')

@app.route('/contact')
def contact():
    return render_template('contact.html')

if __name__ == '__main__':
    app.run(debug=True , port=25563)
```

يتم إنشاء تطبيق Flask باستخدام الكود app = Flask(__name__).

يتم تمرير __name__ كمعامل لتحديد اسم التطبيق وتحديد موقع ملفات html.

يتم تعريف المسارات (routes) باستخدام المزخرف @app.route

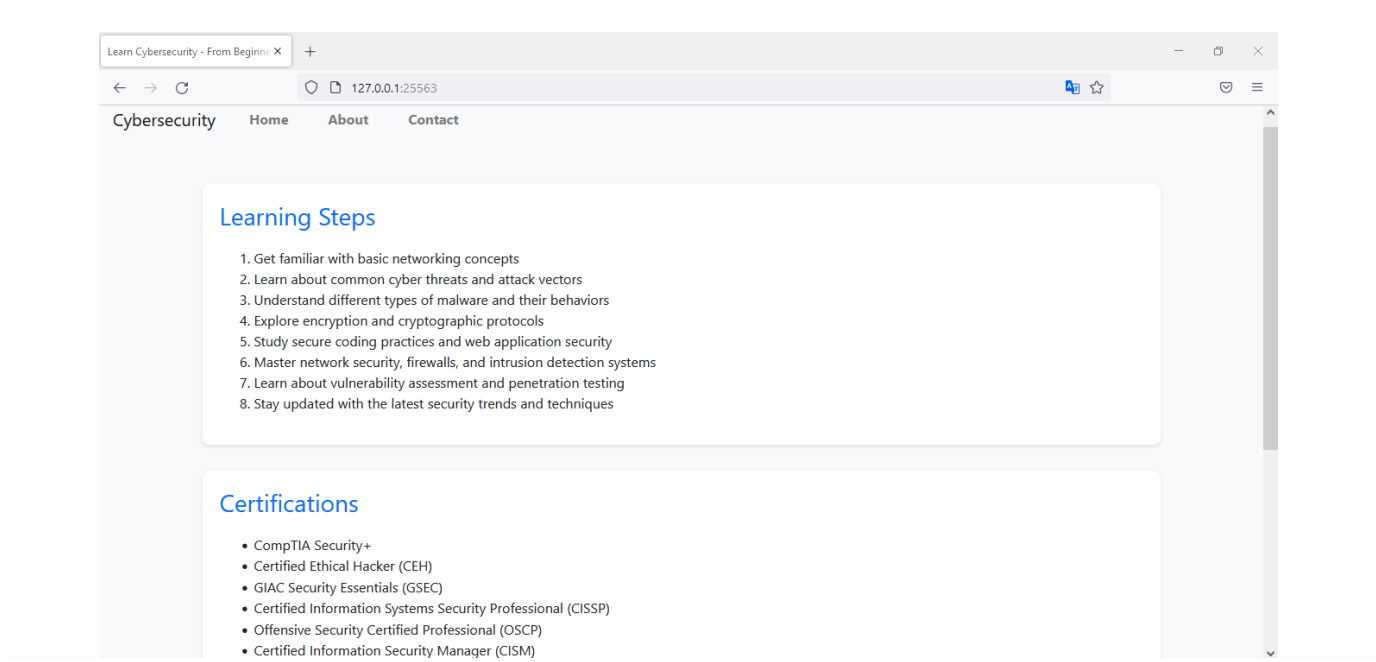
المسار /template يعود إلى الصفحة الرئيسية ويتم تعيينه لدالة home().

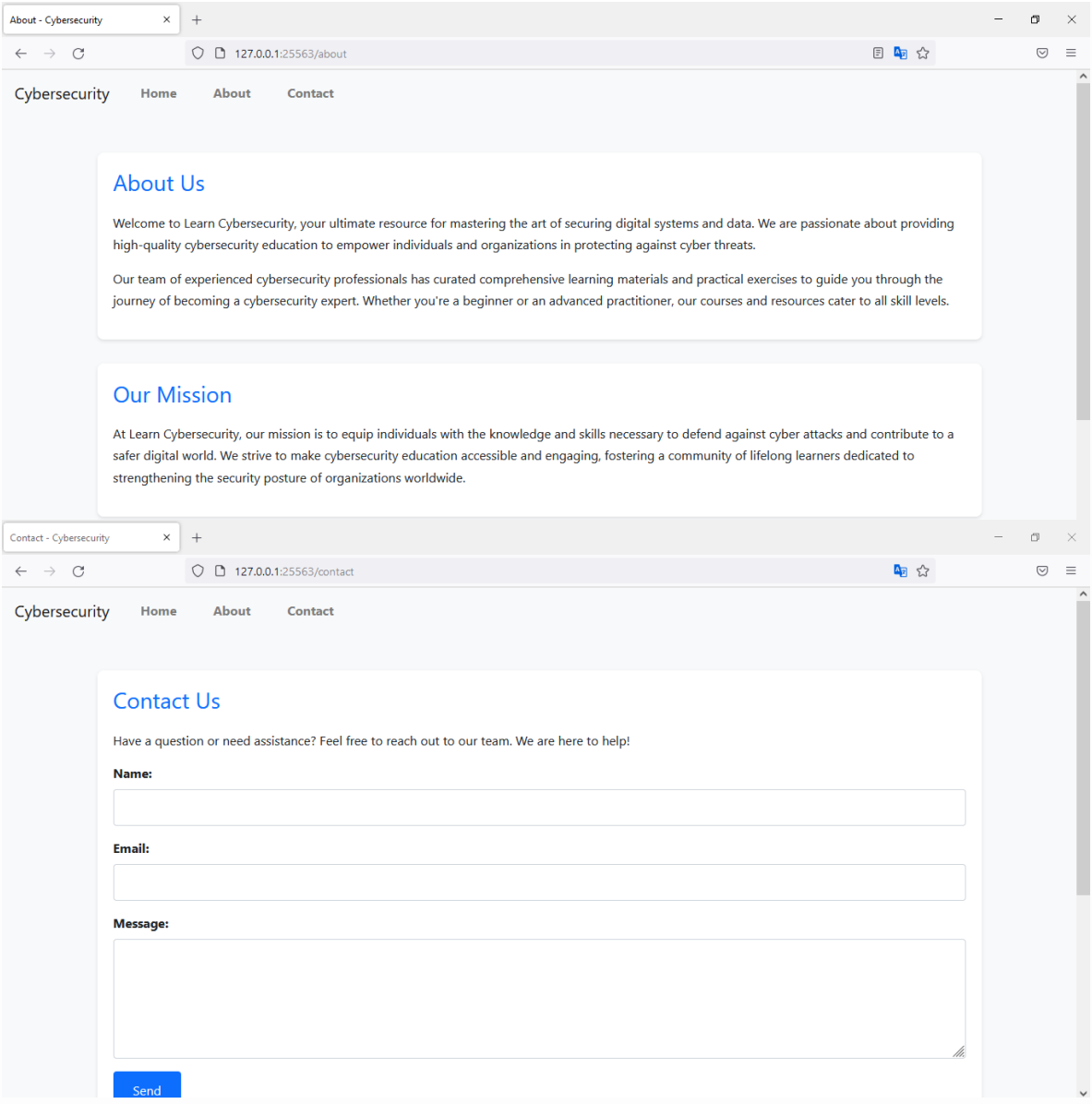
المسار /template/about يعود إلى صفحة "about" ويتم تعيينه لدالة about().

المسار /template/contact يعود إلى صفحة " contact" ويتم تعيينه لدالة contact().

إذا كان البرنامج يتم تشغيله مباشرة عن طريق تشغيل البرنامج الرئيسي ، فإنه يشغل التطبيق بتفعيل وضع التصحيح (debug mode) بواسطة الأمر app.run(debug=True).

يتم التشغيل على port 25563




About - Cybersecurity
127.0.0.1:25563/about
Cybersecurity
Home
About
Contact
About Us
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At Learn Cybersecurity, our mission is to equip individuals with the knowledge and skills necessary to defend against cyber attacks and contribute to a safer digital world. We strive to make cybersecurity education accessible and engaging, fostering a community of lifelong learners dedicated to strengthening the security posture of organizations worldwide.
Contact - Cybersecurity
127.0.0.1:25563/contact
Cybersecurity
Home
About
Contact
Contact Us
Have a question or need assistance? Feel free to reach out to our team. We are here to help!
Name:
Email:
Message:
Send