IT314 - Software Engineering

Lab-5 Static Analysis

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Github Repository link:
https://github.com/jilmajiwala247/Distributed-Mutual-Exclusion

Static Analysis:

Static analysis is a method of examining the source code of a software program without executing it. Static analysis can help detect errors, bugs, vulnerabilities, and other quality issues in the code. Static analysis tools can perform various tasks such as checking syntax, style, logic, data flow, control flow, and security. Static analysis can improve the reliability, performance, and maintainability of software by identifying and correcting defects early in the development process.

1.

```
1  # Create a socket
2  client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
3
4  # Connect to the server
5  server_address = ('localhost', 2000)
6  client_socket.connect(server_address)
7
8  # Get user choice
9  choice = input("Enter 1 for addition, 2 for factorial, 3 for binary: ")
10
11 # Send user choice to the server
12 client_socket.sendall(choice.encode())
13
14 # Get user input
15 if choice == '1':
16     num1 = input("Enter first number: ")
17     num2 = input("Enter second number: ")
18     client_socket.sendall(num1.encod())
19     client_socket.sendall(num2.encode())
20 elif choice == '2':
21     num = input("Enter number for factorial: ")
22     client_socket.sendall(num.encode())
23 elif choice == '3':
24     num = input("Enter decimal number for binary: ")
25     client_socket.sendall(num.encode())
26 else:
27     print("Invalid choice")
28
29 # Receive the result from the server
30 result = client_socket.recv().decode()
31 print("Result from server: ", result)
32
```

Failed (exit code: 1) (2892 ms)

```
main.py:2: error: Name "socket" is not defined  [name-defined]
main.py:18: error: "str" has no attribute "encod"; maybe "encode"?  [attr-defined]
Found 2 errors in 1 file (checked 1 source file)
```

First error states that the socket library is not installed. This is the false negative error as in our PC, the library is installed and code works fine.

Second error states that the attribute that we are using is not defined. This is the false negative error as the attribute is not defined properly.

2.

```
24      client_socketsendall(num.encode())
25  elif choice == '3':
26      num = input("Enter decimal number for binary: ")
27      client_socket.sendall(num.encode())
28  else:
29      print("Invalid choice")
30      client_socketclose()
31
32  # Receive the result from the server
33  result = client_socket.recv(1024).decode()
34  print("Result from server: ", result)
35
36  # Close the socket
37  print("Client Disconnect")
38  client_socket.close()
```

Failed (exit code: 1) (3244 ms)

```
main.py:24: error: Name "client_socketsendall" is not defined  [name-defined]
main.py:30: error: Name "client_socketclose" is not defined  [name-defined]
Found 2 errors in 1 file (checked 1 source file)
```

First error states that the function name is not defined.This is false negative as we are missing “.”.
Second error states that the function name is not defined. This is a false negative as we are missing “.”

3.

```python
import socket
import numpy

# Create a socket
server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)


# Bind the socket to a specific address and port
server_address = ('localhost', 2000)
server_socket.bind(server_address)

# Listen for incoming connections
server_socket.listen(1)


while True:
    # Wait for a client to connect
    print("Waiting for a client to connect...")
    client_socket, client_address = server_socket.accept()

    try:
        # Receive user choice
        choice = client_socket.recv(1024).decode()

        # Receive user input
        if choice == '1':
            print("Client has selected first option\n")
            num1 = client_socket.recv(1024).decode()
            num2 = client_socket.recv(1024).decode()
            result = str(int(num1) + int(num2))
        elif choice == '2':
            print("Client has selected second option\n")
```

Failed (exit code: 1) (3518 ms)

```
main.py:2: error: Cannot find implementation or library stub for module named "numpy"  [import]
main.py:2: note: See https://mypy.readthedocs.io/en/stable/running_mypy.html#missing-imports
```

The error states that in the implementation of the programme, we are not using the “numpy” module. This is false negative as our implementation does not need this module.

4.

```
32              num = int(client_socket.recv(1024).decode())
33              result = 1
34              for i in range(1, num+1):
35                  result *= i
36              result = str(result)
37          elif choice == '3':
38              print("Client has selected third option\n")
39              num = int(client_socket.recv(1024).decode())
40              result = bin(num)
41          else:
42              result = "Invalid choice"
43
44          # Send the result back to the client
45          client_socket.sendall(result.encode())
46      finally:
47          # Close the client socket
48          print("Server Disconnet")
49          client_socket.close()
```

Failed (exit code: 1) (3622 ms)

```
main.py:33: error: Incompatible types in assignment (expression has type "int", variable has type "str")  [assignment]
Found 1 error in 1 file (checked 1 source file)
```

The error states that in the expression, variable is used with the different data type. This is false negative as the variables must have the same data type.

5.

```
78      def software_engineering(self, release):
79
80  # Create a list of Site objects, with IDs 0 through 2
81  sites = [Site(i) for i in range(3)]
82
83  # Create a list of threads, where each thread runs the 'send_request' method for a different Site object
84  threads = []
85  for site in sites:
86      t = Thread(target=site.send_request)
87      threads.append(t)
88
89  # Start each thread
90  for thread in threads:
91      thread.start()
92
93  # Wait for each thread to finish executing
94  for thread in threads:
```

Failed (exit code: 2) (912 ms)

```
main.py:81: error: expected an indented block after function definition on line 78  [syntax]
Found 1 error in 1 file (errors prevented further checking)
```

The error states the code has syntax error. This is a false negative error as we have not completed the block of the function code.

6.

```
53        if len(self.replies_received) ==:
54            self.enter_critical_section()
55
56    def enter_critical_section(self):
57        # Add the request at the front of the request queue to the site's queue, print the queue,
58        self.queue.append(self.request_queue.pop(0))
59        print(f"Site {self.site_id}: Adding request ({self.queue[-1][0]}, {self.queue[-1][1]}) to
60        print(f"Site {self.site_id}: Entering critical section at time {time.time()}")
61        time.sleep(2)
62        self.release()
63
64    def release(self):
```

Failed (exit code: 2) (975 ms)

```
main.py:53: error: invalid syntax; you likely need to run mypy using Python 3.11 or newer  [syntax]
Found 1 error in 1 file (errors prevented further checking)
```

The error states that the code or the implementation has invalide syntax. This is a false negative error as we have left the condition incomplete.

7.

```
72  # Create a list of Site objects, with IDs 0 through 2
73  sites = [Site(i) for i in range(3)]
74
75  # Create a list of threads, where each thread runs the 's
76  threads = []
77  for site in sites:
78      t = Thread(target=site.send_request)
79      threads.append(t)
80
81  # Start each thread
82  for thread in threads:
83      thread.start()
84
85  # Wait for each thread to finish executing
86  for thread in threads:
87      thread.join()
```

Failed (exit code: 1) (3219 ms)

```
main.py:73: error: Too many arguments for "Site"  [call-arg]
Found 1 error in 1 file (checked 1 source file)
```

The error states that the variable is having too many arguments. This is false negative as we have not initialized a function that is required.