Python For DevOps

Enhancing Automation and Efficiency

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Day-01

Overview of Python in DevOps

Overview of DevOps:

Briefly describe the DevOps culture and its goals—emphasizing automation, collaboration between development and operations teams, and continuous integration/delivery.

Python in DevOps

Highlight why Python has become a go-to scripting language for DevOps engineers. Its simplicity, flexibility, and vast ecosystem of libraries make it ideal for DevOps automation and integrations.

Four Pillers of Any Programming Language:

- Keywords
- Data Types
- Operators
- Logic Reasoning Skills

Key Advantages of Python in DevOps

- Ease of Use:
  - Python’s readable syntax and ease of learning make it accessible for both beginner and experienced DevOps engineers
- Cross-Platform Compatibility:
  - Python scripts run on multiple operating systems, including Linux, Windows, and macOS, ensuring consistency across environments.
- Rich Library Ecosystem:
  - Python has extensive libraries for interacting with APIs, automating infrastructure, and working with data, making it suitable for various DevOps use cases.
- Community and Support:
  - Python’s strong community support ensures fast problem-solving and access to many resources and tools.

Core Use Cases of Python in DevOps

1. Automation of CI/CD Pipelines

   Automating deployment, testing, and version control using tools like Jenkins, GitLab CI, or CircleCI with Python scripts.

2. Infrastructure as Code (IaC)

   Provisioning and managing cloud resources and infrastructure using Python with tools like Terraform and AWS Boto3 SDK.

3. Configuration Management

   Managing configurations across different environments using Python to ensure uniformity in deployment pipelines.

4. System Monitoring & Alerts

   Creating monitoring scripts for logging, alerting, and integrating with platforms like Nagios, Prometheus, or Grafana.

5. Log Management and Analysis

   Parsing and analyzing logs with Python for real-time monitoring and error tracking.

6. API Integration

   Utilizing Python for interacting with external services via REST APIs, like integrating with cloud providers (AWS, Azure) or monitoring services (DataDog, Splunk).

7. Cloud Automation

   Using Python scripts to automate tasks in AWS, Google Cloud, and Azure like resource provisioning, scaling, and managing deployments.

8. Container Management and Orchestration:

   Automating the management of Docker containers and Kubernetes clusters through Python scripts and API integrations.

Tools and Libraries for Python in DevOps

- Boto3: Automates AWS services for tasks like creating EC2 instances, S3 buckets, or managing RDS databases.

- Ansible: Python-based tool that automates configuration management, software deployment, and orchestration.

- Requests: Simplifies interacting with APIs, useful for DevOps tasks like monitoring or cloud service management.

- Kubernetes Python Client: Automates the management of Kubernetes clusters through API interactions.

Best Practices for Using Python in DevOps

- Modularity:
    - Write modular Python code that can be reused across multiple scripts or projects.
- Error Handling:
    - Implement proper error handling to ensure scripts can gracefully recover from failures or report meaningful issues.
- Version Control:
    - Use Git to manage and version Python scripts, ensuring transparency and tracking of changes in automation scripts.
- Logging and Monitoring:
    - Implement logging within Python scripts to keep track of script performance and errors during execution.
- Security Considerations:
    - Ensure Python scripts handling sensitive data (e.g., credentials or tokens) follow security best practices, like encryption and secure storage.

Sample Python Script:

File Save format with .py extension.
test.py
```
print("Hello, World!")
```

python test.py → Output: Hello, World!

Day-02
Data Types

What is Data Type:

- Python provides several built-in data types to store and manipulate data.
- **Python is a - Dynamically Type Programming language** where we are not explicitly mentioning the data types definition.

Below are the data types in the Python:

1. Numeric Types
2. Sequence Types
3. Mapping Type
4. Set Types
5. Boolean Type
6. Binary Types
7. None Type

1. **Numeric Types:**
    a. int: Represents integers, which are whole numbers, positive or negative.
        i. a = 10 # Example of an integer
    b. float: Represents floating-point numbers (decimals).
        i. b = 10.5 # Example of a float
    c. complex: Used for complex numbers, consisting of a real and an imaginary part.
        i. c = 2 + 3j # Example of a complex number
2. **Sequence Types**
    a. str: Represents strings, which are sequences of Unicode characters.
        i. name = "DevOps Automation" # Example of a string
    b. list: A mutable, ordered collection of items, which can be of any data type.
        i. fruits = ["apple", "banana", "cherry"] # Example of a list
    c. tuple: An immutable, ordered collection of items.
        i. coordinates = (10, 20) # Example of a tuple
3. **Dictionary Type**
    a. dict: A collection of key-value pairs, where the keys must be unique.
        i. person = {"name": "John", "age": 30} # Example of a dictionary
4. **Set Types**
    a. set: An unordered collection of unique elements.
        i. numbers = {1, 2, 3, 4} # Example of a set
    b. frozenset: An immutable version of a set.
        i. frozen_numbers = frozenset({1, 2, 3, 4}) # Example of a frozenset
5. **Boolean Type**
    a. bool: Represents one of two values: `True` or `False`.
        i. is_valid = True # Example of a boolean

6. **Binary Types**
   a. bytes: Immutable sequence of bytes.
      i. byte_data = b"hello" # Example of bytes
   b. bytearray: A mutable sequence of bytes.
      i. byte_array = bytearray(5) # Example of a bytearray with 5 empty byte
7. **None Type**
   a. NoneType: Represents the absence of a value.
      i. result = None # Example of None type

Some Python Code Examples:

# Integer variables

```
num1 = 10
num2 = 5
# Integer Division
result1 = num1 // num2
print("Integer Division:", result1)
# Modulus (Remainder)
result2 = num1 % num2
print("Modulus (Remainder):", result2)
# Absolute Value
result3 = abs(-7)
print("Absolute Value:", result3
```

# Float variables

```
num1 = 5.0
num2 = 2.5
# Basic Arithmetic
result1 = num1 + num2
print("Addition:", result1)
```

#String Examples

```
text = "Python is awesome"
length = len(text)
print("Length of the string:", length)
```

Day-03

Keywords and Variables:

Keywords:

Keywords are reserved words in Python that have a predefined meaning and cannot be used for anything other than their intended purpose, such as naming variables or functions. They are part of the language syntax and serve specific roles like defining functions, control flow, or handling exceptions.

For example:

- **Control flow:** if, else, elif, for, while
- **Function definition:** def, return
- **Boolean values:** True, False
- **Exception handling:** try, except, finally, raise

We can see all the list of available keywords using below simple python program.

```
import keyword
print(keyword.kwlist)
```

Results:

```
['False', 'None', 'True', 'and', 'as', 'assert', 'async', 'await', 'break', 'class', 'continue', 'def', 'del', 'elif', 'else', 'except', 'finally', 'for', 'from', 'global', 'if', 'import', 'in', 'is',

'lambda', 'nonlocal', 'not', 'or', 'pass', 'raise', 'return', 'try', 'while', 'with', 'yield']
```

Variables:

Symbolic names that reference values stored in memory. In Python, variables do not need explicit declaration and are created when you assign a value to them. Variable names can contain letters, numbers, and underscores, but they **cannot start with a number** and **cannot use keywords** as names.

Rules for Variables:

- ➢ Must start with a letter or underscore (_).
- ➢ Can contain letters, numbers, and underscores (_).
- ➢ Case-sensitive, so myVar and myvar are different variables.
- ➢ Cannot use Python keywords as variable names.

Example:

```
# Creating variables
name = "Alice"          # String variable
age = 30                # Integer variable
is_active = True        # Boolean variable
height = 5.6            # Float variable
```

Variables Scope:

The scope of a variable refers to the region of the program where that variable is accessible. Variables can have different scopes depending on where they are declared. Python has four types of variable scopes.

LEGB Rule

Python follows the **LEGB rule** to resolve variable names:

1. **Local:** The interpreter first checks for the variable in the current local scope.
2. **Enclosing:** If not found, it checks the enclosing (nonlocal) scope.
3. **Global:** Then it checks the global scope.
4. **Built-in:** Finally, it checks the built-in scope.

Example for the LEGB rule:

```
x = "global"

def outer():
    x = "enclosing"

    def inner():
        x = "local"
        print(x)  # "local"

    inner()
    print(x)  # "enclosing"

outer()
print(x)  # "global"
```

1. Local Scope

A variable defined inside a function is called a local variable. It is accessible only within that function and not outside of it.

```python
def my_function():
    x = 10  # Local variable
    print(x)

my_function()
# print(x)  # Error: x is not defined outside the function
```

2. Enclosing (Nonlocal) Scope

Variables in an enclosing scope are variables from the outer function that can be accessed by inner functions. The nonlocal keyword is used to modify them inside nested functions.

```python
def outer_function():
    x = 10  # Enclosing variable
    def inner_function():
        nonlocal x  # Modify the enclosing variable
        x = 20
        print("Inner:", x)
    inner_function()
    print("Outer:", x)

outer_function()
```

3. Global Scope

A global variable is defined at the top level of a script or module and is accessible from any part of the program. To modify a global variable inside a function, the global keyword is used.

```python
x = 5  # Global variable

def my_function():
    global x  # Modify the global variable
    x = 10

my_function()
print(x)  # Output: 10
```

4. Built-in Scope

The built-in scope contains names that are preloaded in Python, such as print(), len(), etc. These variables are accessible globally unless shadowed by local or global variables.

```
print(len([1, 2, 3]))  # 'len' is a built-in function
```

Day-04

Functions, Modules and Packages

Functions:

In Python function is a block of reusable code designed to perform a specific task. Functions allow for more organized, modular, and maintainable code.

Syntax:

```
def function_name(parameters):
    # Block of code
    return value
```

Example:

```
def greet(name):
    return f"Hello, {name}!"

print(greet("Alice"))
```

Note:

- **Arguments/Parameters**: Data passed into functions.
- **Return Statement**: A function can return values using return.
- Functions can be **called** multiple times with different inputs, promoting code reuse.

Modules:

A module is a file containing Python definitions and statements (e.g., functions, classes, or variables) that can be imported and used in other Python scripts.

Creating a Module:

Any Python file (e.g., my_module.py) is a module. Suppose we have a file named my_module.py:

```
# my_module.py
def add(a, b):
    return a + b

def subtract(a, b):
    return a - b
```

Importing a Module:

You can import and use the module's functions in another script:

```python
# main.py
import my_module

result = my_module.add(5, 3)
print(result)  # Output: 8
```

Importing Specific Functions:

```python
from my_module import add
print(add(5, 3))  # Output: 8
```

Python Standard Library:

Python comes with many pre-built modules (e.g., math, os, sys) that you can import and use without writing your own.

```python
import math
import os
import json

print(math.sqrt(16))  # Output: 4.0
```

Packages:

A package is a collection of Python modules organized in directories. Each package contains an __init__.py file, which signifies that the directory is a Python package. Packages help you organize related modules into a hierarchy.

Creating a Package:

The structure of a package might look like this:

```
my_package/
    __init__.py     # Initializes the package
    module1.py      # A module inside the package
    module2.py      # Another module
```

Example of Package:

my_package/module1.py

```
    def greet():
    return "Hello from module1"
```

my_package/module2.py

```
    def farewell():
    return "Goodbye from module2"
```

my_package/init.py This file can be empty, or it can define symbols that will be available when you import the package.

Importing a Package:

```
    # main.py
    from my_package import module1, module2
    print(module1.greet())      # Output: Hello from module1
    print(module2.farewell())   # Output: Goodbye from module2
```

Installing External Packages:

You can install third-party packages using pip, Python's package manager.

```
pip install package_name
```

For example, installing the popular requests package:

```
pip install requests
```

You can then use it in your program:

```
import requests
response = requests.get("https://api.github.com")
print(response.status_code)
```

Function Example:

```python
num1 = 10
num2 = 20
def addition():
    add = num1 + num2
    print(add)

def substraction():
    sub = num2 - num1
    print(sub)

def multipication():
    mul = num1 * num2
    print(mul)

addition()
substraction()
multipication()
```

```python
#Another Way Writing the Function:

def addition(num1,num2):
    add = num1 + num2
    return add

def subtract(num1,num2):
    sub = num2 - num1
    return sub

def multipication(num1,num2):
    mul = num1 * num2
    return mul

print(addition(50,10))
print(subtract(5,10))
print(multipication(10,20))
```

Module Example:

```python
import function_test as func1
func1.addition()
```

Day-05
CLI Arguments & Env Variables

Command Line Arguments in Python allow a user to provide input to a Python script when it is executed from the command line. This is useful for passing options, filenames, or parameters to scripts at runtime.

In Python, command line arguments are stored in the sys.argv list, provided by the sys module.

Using sys.argv

The sys.argv list contains the arguments passed to the script:

- sys.argv[0] is the name of the script itself.
- sys.argv[1], sys.argv[2], etc., represent the arguments passed to the script.

Example:

```
# script.py
import sys

# sys.argv contains the list of command line arguments
print("Script Name:", sys.argv[0])
if len(sys.argv) > 1:
    print("Arguments passed:", sys.argv[1:])
else:
    print("No arguments provided.")

Running the Script from the Command Line:
$ python script.py arg1 arg2 arg3

Output:
Script Name: script.py
Arguments passed: ['arg1', 'arg2', 'arg3']
```

Environment variables are dynamic variables maintained by the operating system that can affect the way running processes behave. They are often used for configuration settings, like database credentials, API keys, or system paths, and provide a way to pass information into a program without hardcoding it.

- In Python, environment variables can be accessed using the **os** module.
- You can use the os.environ dictionary to access environment variables.

Example:

Defining the Environment variables like

```
export DB_HOST="localhost"
```

in Python program:

```
import os
print(os.getenv("DB_HOST"))
```

We can define like below as well:

```
import os
db_host = os.getenv('DB_HOST', 'localhost')
db_port = os.getenv('DB_PORT', ‘3306’)
db_user = os.getenv('DB_USER', 'admin')
db_password = os.getenv('DB_PASSWORD', 'password')

print(f"Connecting to database at {db_host}:{db_port} as {db_user}")
```

On Linux/MacOS (Bash):

```
export DATABASE_URL="postgres://user:pass@localhost:5432/mydb"
```

On Windows (Command Prompt):

```
set DATABASE_URL=postgres://user:pass@localhost:5432/mydb
```

Day-06
Operators in Python

Operators are symbols that perform operations on variables and values. Python supports various types of operators, categorized based on the type of operations they perform.

Here are the main types of operators in Python:

1. Arithmetic: **+, -, *, /, //, %, ****
2. Comparison: **==, !=, >, <, >=, <=**
3. Logical: **and, or, not**
4. Assignment: **=, +=, -=, *=, /=, //=, %=, **=**
5. Bitwise: **&, |, ^, ~, <<, >>**
6. Identity: **is, is not**
7. Membership: **in, not in**

1. Arithmetic Operators

- Arithmetic operators are used for performing basic mathematical operations.

Operator	Description	Example
+	Addition	3 + 2 = 5
-	Subtraction	3 - 2 = 1
*	Multiplication	3 * 2 = 6
/	Division (float result)	3 / 2 = 1.5
//	Floor Division (integer)	3 // 2 = 1
%	Modulus (remainder)	3 % 2 = 1
**	Exponentiation (power)	3 ** 2 = 9

Example:

```
a = 5
b = 3
print(a + b)   # 8
print(a // b)  # 1
print(a ** b)  # 125
```

2. Comparison (Relational) Operators

These operators are used to compare values. They return True or False.

Operator	Description	Example
==	Equal to	3 == 2 → False
!=	Not equal to	3 != 2 → True
>	Greater than	3 > 2 → True
<	Less than	3 < 2 → False
>=	Greater than or equal to	3 >= 2 → True
<=	Less than or equal to	3 <= 2 → False

Example:

```
a = 5
b = 3
print(a > b)   # True
print(a == b)  # False
```

3. Logical Operators

Logical operators are used to perform logical operations on expressions and return True or False.

Operator	Description	Example
and	True if both conditions are True	(3 > 2) and (4 > 3) → True
or	True if at least one condition is True	(3 > 2) or (4 < 3) → True
not	Inverts the boolean value	not(3 > 2) → False

Example:

```
x = True
y = False
print(x and y)  # False
print(x or y)   # True
print(not x)    # False
```

4. Assignment Operators

These operators are used to assign values to variables. They can also perform arithmetic operations during assignment.

Operator	Description	Example
=	Assigns value	a = 5
+=	Add and assign	a += 2 (a = a + 2)
-=	Subtract and assign	a -= 2 (a = a - 2)
*=	Multiply and assign	a *= 2 (a = a * 2)
/=	Divide and assign (float)	a /= 2 (a = a / 2)
//=	Floor divide and assign	a //= 2
%=	Modulus and assign	a %= 2
**=	Exponentiate and assign	a **= 2

Example:

```
a = 5
a += 3  # a = a + 3 → a = 8
print(a)  # Output: 8
```

5. Bitwise Operators

Bitwise operators perform operations on binary representations of integers.

Operator	Description	Example
&	Bitwise AND	5 & 3 = 1
`	`	Bitwise OR
^	Bitwise XOR	5 ^ 3 = 6
~	Bitwise NOT	~5 = -6
<<	Left shift	5 << 1 = 10
>>	Right shift	5 >> 1 = 2

Example:

```
a = 5  # 0101 in binary
b = 3  # 0011 in binary
print(a & b)   # 1 (0001 in binary)
print(a | b)   # 7 (0111 in binary)
```

6. Identity Operators

Identity operators check whether two variables refer to the same object in memory.

Operator	Description	Example
is	True if both variables point to the same object	a is b
is not	True if both variables do not point to the same object	a is not b

Example:

```
a = [1, 2, 3]
b = a
c = [1, 2, 3]
print(a is b)   # True (both point to the same object)
print(a is c)   # False (different objects, even though values are the same)
```

7. Membership Operators

Membership operators test for membership in a sequence, such as strings, lists, or tuples.

Operator	Description	Example
in	True if the value is found in the sequence	3 in [1, 2, 3] → True
not in	True if the value is not found in the sequence	4 not in [1, 2, 3] → True

Example:

```
a = [1, 2, 3]
print(2 in a)      # True
print(4 not in a)  # True
```

Operator Precedence

Operator precedence determines the order in which operations are performed. For example, multiplication has a higher precedence than addition.

Example:

```
result = 3 + 5 * 2  # Multiplication happens first, so result is 13
To control precedence, use parentheses:
result = (3 + 5) * 2  # Now addition happens first, so result is 16
```

Assignment Questions Programs:

```
##############################################
#Arthimatic Operators:
a = 10
b = 15
sum = a + b
sub = a  - b
mul = a * b
div = a / b

print("########################################")
print("Arthimatic Operators:")
print("Sum of A & B :",sum)
print("Subtraction of A & B :",sub)
print("Multiplication of A & B :", mul)
print("Division of A & B :", div)

##############################################
#Comparision Operators:

a = 10
b = 15

gretarthan = a > b
lessthan = a < b
greaterthanequeals = a >= b
lessthanequals = a <= b
bothnotequal = a != b
bothequal = a == b

print("########################################")
print("Comparision Operators:")
print("a < b:", lessthan )
print("a > b:",gretarthan)
print("a <= b:",lessthanequals)
print("a >= b:",greaterthanequeals)
print("a != b:",bothnotequal)
print("a == b:",bothequal)

##############################################
#Logical Operators:
a = 10
b = 15
```

```
andlogic = a and b
orlogic = a or b
anotlogic = not b
bnotlogic = not a

print("########################################")
print("Logical Operators:")
print("a and b:", andlogic )
print("a or b:",orlogic)
print("a not b:",anotlogic)
print("b not a:",bnotlogic)


##############################################
#Assignment Operators:
a = 10
c = 2
d = 3
e = 4
f = 5

b = a
c += a
d -= a
e *= a
f /= a

print("########################################")
print("Assignment Operators:")
print("= b value is:", b )
print("+= c value is:", c )
print("-= d value is:", d )
print("*= e value is:", e )
print("/= f value is:", f )


##############################################
#Bitwise Operators
a = 12
b = 10

bitand = a & b
bitor = a | b
bitxor = a ^ b
bitleftshift = a << b
```

```
bitrightshift = a >> b

print("########################################")
print("Bitwise Operators:")
print("a & b value is:", bitand )
print("a | b value is:", bitor )
print("a ^ b value is:", bitxor )
print("a <<  b value is:", bitleftshift )
print("a >> b value is:", bitrightshift )

##############################################
#Identity Operators:
a = [1,2,3,4,5]
b = a
c = 10

identis = b is a
identisnot = c is not a
identis1 = a is b
identisnot1 = a is not b

print("########################################")
print("Identity Operators:")
print("b is a value is:", identis )
print("c is not a value is:", identisnot)
print("a is b value is:", identis1 )
print("a is not b value is:", identisnot1)


##############################################
#Membership Operators:
a = [1,2,3,4,5]
b = a
c = 10

memberis = b in a
memberisnot = c not in a
memberis1 = a in b
memberisnot1 = a not in b

print("########################################")
print("Membership Operators:")
print("b in a value is:", memberis )
print("c in not a value is:", memberisnot)
print("a in b value is:", memberis1 )
```

Mani Gutta

```
print("a in not b value is:", memberisnot1)

################################################
```

Results:

```
##############################################
Arthimatic Operators:
Sum of A & B : 25
Subtraction of A & B : -5
Multiplication of A & B : 150
Division of A & B : 0.6666666666666666
##############################################
Comparision Operators:
a < b: True
a > b: False
a <= b: True
a >= b: False
a != b: True
a == b: False
##############################################
Logical Operators:
a and b: 15
a or b: 10
a not b: False
b not a: False
##############################################
Assignment Operators:
= b value is: 10
+= c value is: 12
-= d value is: -7
*= e value is: 40
/= f value is: 0.5
##############################################
Bitwise Operators:
a & b value is: 8
a | b value is: 14
a ^ b value is: 6
a <<  b value is: 12288
a >> b value is: 0
##############################################
Identity Operators:
b is a value is: True
c is not a value is: True
a is b value is: True
a is not b value is: False
##############################################
Membership Operators:
b in a value is: False
c in not a value is: True
a in b value is: False
a in not b value is: True
```

Day-07
Condition Handlings

Conditional statements in Python allow you to execute certain code based on the evaluation of a condition. These statements include if, else, and elif (else if). They enable decision-making in your program, where different actions can be taken based on the given conditions.

- If
- else
- elseif
- nestedif

1. if Statement

The if statement evaluates a condition and executes the indented block of code if the condition is True.

Syntax:

```
if condition:
```

Example:

```
x = 10
if x > 5:
    print("x is greater than 5")  # This will be printed
since the condition is True
```

2. else Statement

The else statement follows an if statement and is executed when the if condition is False.

Syntax:

```
if condition:
      # Block of code if condition is true
else:
       # Block of code if condition is false
```

Example:

```
x = 3
if x > 5:
    print("x is greater than 5")
else:
    print("x is 5 or less")  # This will be printed
```

3. elif (else if) Statement

The elif statement allows you to check multiple expressions for True and execute the corresponding block for the first True condition. It's used when there are more than two possible outcomes.

Syntax:

```
if condition1:
    # Block of code if condition1 is true
elif condition2:
    # Block of code if condition2 is true
else:
    # Block of code if none of the conditions are true
```

Example:

```
x = 8
if x > 10:
    print("x is greater than 10")
elif x == 8:
    print("x is 8")  # This will be printed
else:
    print("x is less than 8")
```

4. Nested if Statements

nested if statements, which means using an if or elif inside another if or else block. This is useful when you have complex conditions to evaluate.

Example:

```
x = 10
y = 5

if x > 5:
    if y < 10:
        print("x is greater than 5 and y is less than 10")  # This will be
printed
```

Example of Complex Conditions:

```
x = 10
y = 20
if x > y:
    print("x is greater than y")
elif x == y:
    print("x is equal to y")
else:
    print("x is less than y")  # This will be printed since x < y
```

Day-08
List & Tuples

List in Python:

A **list** in Python is a mutable, ordered sequence of elements. Lists can contain elements of different types, and their elements can be modified after creation.

Characteristics of a List:

- **Mutable**: Elements can be changed, added, or removed.
- **Ordered**: Items have a defined order, and this order will not change unless explicitly modified.
- **Allows duplicates**: Lists can have multiple items with the same value.

Creating a List in Python:

```
my_list = [1, 2, 3, 4, 5]
mixed_list = [1, "Hello", 3.14, True]
```

Accessing Elements in a List:

You can access elements by their index. The index starts at 0.

```
print(my_list[0])  # Output: 1
print(mixed_list[1])  # Output: Hello
```

List Methods:

- **append()**: Add an item to the end of the list.
- **insert()**: *Insert an item at a specified index.*
- **remove()**: *Remove the first item with the specified value.*
- **pop()**: *Remove an item at a specified index (or the last item if no index is provided).*
- **sort()**: *Sort the list in place.*

Example:

```
my_list = [1,2,3,4,5,6,7,8,9]
print("My Original List")
print(my_list)

print("Changing an element of 0th Position")
my_list[0] = 10
print(my_list)  # Output: [10, 2, 3, 4, 5]
print("Adding elements")
my_list.append(16) # Adds 6 to the end of the list
print(my_list)

print("Inserts elements")
my_list.insert(2, 100)  # Inserts 100 at index 2
print(my_list)

print("Removing elements the first occurences of 3")
my_list.remove(3)  # Removes the first occurrence of 3
print(my_list)

print("Removes the last element")
my_list.pop()  # Removes the last element
print(my_list)

print("Sorting the last element")
my_list.sort()
print(my_list)
```

Results:

```
My Original List
[1, 2, 3, 4, 5, 6, 7, 8, 9]
Changing an element of 0th Position
[10, 2, 3, 4, 5, 6, 7, 8, 9]
Adding elements
[10, 2, 3, 4, 5, 6, 7, 8, 9, 16]
Inserts elements
[10, 2, 100, 3, 4, 5, 6, 7, 8, 9, 16]
Removing elements the first occurences of 3
[10, 2, 100, 4, 5, 6, 7, 8, 9, 16]
Removes the last element
[10, 2, 100, 4, 5, 6, 7, 8, 9]
Sorting the last element
[2, 4, 5, 6, 7, 8, 9, 10, 100]
```

Tuples:

A **tuple** in Python is an immutable, ordered sequence of elements. Like lists, tuples can contain elements of different types, but their elements cannot be modified once the tuple is created.

Characteristics of a Tuple:

- **Immutable**: Elements cannot be changed after the tuple is created.
- **Ordered**: Items have a defined order.
- **Allows duplicates**: Tuples can contain multiple items with the same value.

Creating Tuple in Python:

```
my_tuple = (1, 2, 3)
mixed_tuple = (1, "Hello", 3.14, True)

# A tuple with one element needs a trailing comma
single_element_tuple = (5,)
```

Accessing Elements in a Tuple:

Like lists, you can access tuple elements by their index.

```
print(my_tuple[0])  # Output: 1
```

Methods in Tuples:

Since tuples are immutable, they have fewer methods than lists. However, two useful methods are:

- **count()**: Returns the number of times a specified value occurs in a tuple.
- **index()**: Returns the index of the first occurrence of a specified value.

Example:

```
my_tuple = (1, 22, 3, 2, 4)
print(my_tuple.count(1))  # Output: 2
print(my_tuple.index(3))  # Output: 4
```

Uses of Tuples Instead of Lists?

- **Immutability**: Tuples are immutable, which means they are safer when you want to ensure that data does not change accidentally.
- **Performance**: Tuples are slightly more efficient in terms of memory and performance compared to lists.
- **Used as keys in dictionaries**: Tuples can be used as dictionary keys because they are hash-able, while lists cannot.

Key Differences Between Lists and Tuples:

Feature	List	Tuple
Mutability	Mutable (can be changed)	Immutable (cannot be changed)
Syntax	Created with []	Created with ()
Methods	More methods (e.g., append(), remove())	Fewer methods (e.g., count(), index())
Performance	Slower, uses more memory	Faster, uses less memory
Use Cases	Use when data can change	Use when data should remain constant

Basic Questions:

Q1: What is a list in Python, and how is it used in DevOps?

- List is collection of elements
- List is mutable in python.
- Sequence of elements in the define list.
- List can be multiple data types.
- In devops list can be used to store and manipulate data, such as configurations, target servers, deployment.

Q2: How do you create a list in Python, and can you provide an example related to DevOps?

- List can be define in the square brackets – []
- Example: my_list = [1,2,3,4]
- In devops we will use list to define the instance type, list of S3 buckets etc.

Q3: What is the difference between a list and a tuple in Python, and when would you choose one over the other in a DevOps context?

- List is mutable and tuple is immutable
- Syntax for list is [] and for tuple is ()
- Performance wise list is slower, uses more memory, where tuple is less and uses less memory.
- For the server configuration, target servers and deployment nodes we can use the list.
- For admin related information, deployment steps and configuration servers stores we will use tuples.

Q4: How can you access elements in a list, and provide a DevOps-related example?

- My_list = [1,2,3,4,5]
- Access the list using the index – my_list[0] → 1

Q5: How do you add an element to the end of a list in Python? Provide a DevOps example.

- My_list = [1,2,3,4]
- My_list.append(5)

Q6: How can you remove an element from a list in Python, and can you provide a DevOps use case?

- My_list = [1,2,3,4]
- My_list.remove(2)

Day-09
Loops

Loops in Python allow you to execute a block of code repeatedly, either for a specified number of times or while a certain condition is true. Python provides two main types of loops: for loops and while loops.

for Loop:

A for loop in Python is used to iterate over a sequence (such as a list, tuple, string, or range) and execute a block of code for each element in the sequence.

Syntax:

```
for variable in sequence:
    # Code to execute in each iteration
```

Example:

```
fruits = ["apple", "banana", "cherry"]
for fruit in fruits:
    print(fruit)
```

Output:

```
apple
banana
cherry
```

Using **range()** with for Loop:

The range() function generates a sequence of numbers, which is commonly used with loops.

Example:

```
for i in range(4):
    print(i)
```

Output:

```
0
1
2
3
```

while Loop

A while loop repeats as long as a specified condition is True. It is useful when the number of iterations is not predetermined.

Syntax:

```
while condition:
    # Code to execute while the condition is true
```

Example:

```
i = 1
while i <= 4:
    print(i)
    i += 1  # Increment the counter to avoid an infinite loop
```

```
Output:
      1
      2
      3
      4
```

break and **continue** Statements

- The break statement is used to exit the loop prematurely, even if the condition for the loop has not become False.
- The continue statement skips the current iteration and proceeds to the next iteration of the loop.

Example for Break:

```
for i in range(5):
    if i == 3:
        break  # Exits the loop when i equals 3
    print(i)
```

```
Output:
      0
      1
      2
```

Example for Continue:

```
for i in range(5):
    if i == 3:
        continue  # Skips the iteration when i equals 3
    print(i)
```

```
Output:
      0
      1
      2
      4
```

else in Loops:

Python allows you to use an else block with for and while loops. The else block is executed when the loop completes normally, i.e., without hitting a break statement.

Example with for loop:

```
for i in range(5):
    print(i)
else:
    print("Loop completed")
```

```
Output:
      0
      1
      2
      3
      4
      Loop completed
```

Example with while loop:

```
i = 1
while i < 5:
    print(i)
    i += 1
else:
    print("While loop completed")
```

Output:

```
1
2
3
4
While loop completed
```

Nested Loops

You can nest loops, meaning you can place one loop inside another loop. Each iteration of the outer loop runs the inner loop to completion.

Example:

```
    for i in range(3):
        for j in range(2):
            print(f"i = {i}, j = {j}")
Output:
i = 0, j = 0
i = 0, j = 1
i = 1, j = 0
i = 1, j = 1
i = 2, j = 0
i = 2, j = 1
```

Loop Control with **pass**

The pass statement in Python is used when you need a statement syntactically but do not want to execute any code. It is often used as a placeholder.

Example:

```
    for i in range(5):
        if i == 3:
            pass  # Placeholder for future code
        print(i)
```

Output:

```
    1
    2
    3
    4
```

Day-10
Working with Lists

We will deep dive into the list exercise examples to understand more on this.

In Python, you can take input from the user while running the program using the **input()** function. This function waits for the user to type something and press Enter, and then it returns the input as a string.

Example:

```
name = input("Enter your name: ")
print("Hello, {name}!")
```

Output:

```
Enter your name: Sajid
Hello, Sajid!
```

Taking Numerical Input:

By default, the input() function returns the data as a string. If you want to take a numerical input, you need to convert the string to an integer (int()) or a floating-point number (float()).

- Example for Integer Input:

```
age = int(input("Enter your age: "))
print("You are {age} years old.")
```

- Example for Float Input:

```
height = float(input("Enter your height in meters: "))
print("Your height is {height} meters.")
```

Handling Multiple Inputs

If you want to take multiple inputs in a single line, you can use the **split()** method to divide the input into multiple values.

- Example:

```
x, y = input("Enter two numbers separated by space: ").split()
print("x = {x}, y = {y}")
```

```
Output:
Enter two numbers separated by space: 5 10
x = 5, y = 10
```

- You can also directly convert the input values to integers or floats:

```
x, y = map(int, input("Enter two integers: ").split())
print("Sum: {x + y}")
```

Taking Input in a Loop

You can use input() inside a loop to keep asking for input until a certain condition is met.

- Example with while Loop:

```
while True:
    data = input("Enter something (or type 'exit' to quit): ")
    if data.lower() == "exit":
        break
    print("You entered:", data)
```

In this example, the program keeps asking for input until the user types "exit", after which the loop terminates.

- Example:

Full Program to Perform Addition Based on User Input

```
# Python program to take two numbers as input and print their sum
num1 = float(input("Enter first number: "))
num2 = float(input("Enter second number: "))
# Calculate and display sum
sum_of_numbers = num1 + num2
print("The sum of {num1} and {num2} is {sum_of_numbers}")

Output:
Enter first number: 5.5
Enter second number: 4.5
The sum of 5.5 and 4.5 is 10.0
```

Exception Handling:

Python provides the try, except, else, and finally blocks to handle exceptions gracefully without crashing the program.

Syntax:

```
try:
    # Code that might raise an exception
except ExceptionType:
    # Code that runs if the exception occurs
```

Basic Example: Handling an Exception:

```
try:
    result = 10 / 0
except ZeroDivisionError:
    print("Cannot divide by zero!")

Output:
Cannot divide by zero!
```

Example: Listing the files and folders from the user input folder.

Steps:

- Taking the user input using input()
- Listing the files & folders using the for loop
- Using OS module
- Print the output
- Handling the known errors using try & except

Final Program:

```
import os
def listdirectory():
    path_name = input("Enter the path:").split(' ')
    print(path_name)
    for paths in path_name:
        try:
            files = os.listdir(paths)
        except FileNotFoundError:
            print("Enter Valid Folder Path")
            continue
    #for path in paths:
    #print(path)
    #print(files)
        for file in files:
            print(file)
listdirectory()
```

Day-11
Dictionaries & Sets

A dictionary in Python is a data structure that allows you to store and retrieve values using key-value pairs. Each key in the dictionary must be unique and immutable (such as strings, numbers, or tuples), while values can be of any data type and can be duplicated.

Syntax:

```
my_dict = {
    "key1": "value1",
    "key2": "value2",
    "key3": "value3"
}
```

Creating a Dictionary

```
# Dictionary of fruits and their colors
fruit_colors = {
    "apple": "red",
    "banana": "yellow",
    "cherry": "red"
}
```

Accessing Dictionary Elements

You can access the value of a specific key using square brackets [].

```
print(fruit_colors["apple"])  # Output: red
```

You can also use the get() method, which returns None if the key doesn't exist instead of raising an error.

```
print(fruit_colors.get("grape"))  # Output: None
```

Adding and Updating Elements

To add or update an entry, simply assign a value to a key.

```
# Adding a new entry
fruit_colors["grape"] = "purple"

# Updating an existing entry
fruit_colors["banana"] = "green"
```

```
print(fruit_colors)  # Output: {'apple': 'red', 'banana': 'green',
'cherry': 'red', 'grape': 'purple'}
```

Removing Elements

You can remove a key-value pair using the del keyword or the pop() method.

```
# Using del
del fruit_colors["cherry"]

# Using pop
fruit_colors.pop("banana")

print(fruit_colors)  # Output: {'apple': 'red', 'grape': 'purple'}
```

Example using Loops:

```
# Dictionary of fruits and their colors
fruit_colors = {
    "apple": "red",
    "banana": "yellow",
    "cherry": "red"
}

# Looping through keys
for fruit in fruit_colors:
    print(fruit)  # Output: apple, grape

# Looping through values
for color in fruit_colors.values():
    print(color)  # Output: red, purple

# Looping through key-value pairs
for fruit, color in fruit_colors.items():
    print("{fruit} is {color}")

Output:
    apple
    banana
    cherry
    red
    yellow
    red
    apple is red
    banana is yellow
    cherry is red
```

Adding and Removing Elements

- **add()**: Adds a new element to the set.
- **remove()**: Removes an element, raises an error if the element is not found.
- **discard()**: Removes an element, does not raise an error if the element is not found.
- **pop()**: Removes and returns an arbitrary element.
- **clear()**: Removes all elements from the set.

Example:

```
# Adding an element
my_set.add(5)

# Removing an element
my_set.remove(3)

# Removing an element that might not exist
my_set.discard(10)

print(my_set)  # Output: {1, 2, 4, 5}
```

Set:

Unordered collections of unique elements. Sets support mathematical set operations like union, intersection, and difference.

Example:

```
set_a = {1, 2, 3, 4}
set_b = {3, 4, 5, 6}

# Union (all unique elements from both sets)
print(set_a | set_b)  # Output: {1, 2, 3, 4, 5, 6}

# Intersection (common elements)
print(set_a & set_b)  # Output: {3, 4}

# Difference (elements in set_a but not in set_b)
print(set_a - set_b)  # Output: {1, 2}

# Symmetric Difference (elements in either set_a or set_b, but not both)
print(set_a ^ set_b)  # Output: {1, 2, 5, 6}
```

Example Use Case:

- Get Pull Request creators & count information from GIT Repo.

```
# Program to demonstrate integration with GitHub to fetch the
# details of Users who created Pull requests(Active) on Kubernetes Github
repo.
```

```python
import requests

# URL to fetch pull requests from the GitHub API
url = f'https://api.github.com/repos/mdsajid786/Python/pulls'

# Make a GET request to fetch pull requests data from the GitHub API
response = requests.get(url)  # Add headers=headers inside get() for
authentication

# Only if the response is successful
if response.status_code == 200:
    # Convert the JSON response to a dictionary
    pull_requests = response.json()

    # Create an empty dictionary to store PR creators and their counts
    pr_creators = {}

    # Iterate through each pull request and extract the creator's name
    for pull in pull_requests:
        creator = pull['user']['login']
        if creator in pr_creators:
            pr_creators[creator] += 1
        else:
            pr_creators[creator] = 1

    # Display the dictionary of PR creators and their counts
    print("PR Creators and Counts:")
    for creator, count in pr_creators.items():
        print(f"{creator}: {count} PR(s)")
else:
    print(f"Failed to fetch data. Status code: {response.status_code}")
```

```
Output:
PR Creators and Counts:
DeepTests1: 1 PR(s)
SudheerT: 1 PR(s)
AparnaN: 1 PR(s)
ShubhangiS: 1 PR(s)
```

Day-12
File Operations

Python provides built-in functions for file handling, allowing you to create, read, write, and delete files. File operations are done using the open() function, which allows you to work with files in different modes, such as reading (r), writing (w), and appending (a).

Basic File Handling Workflow:

- Open a file using open().
- Read or write to the file.
- Close the file using close() to free up system resources.

Opening a File

The open() function takes two arguments: the filename and the mode. The available modes are:

- "r": Read (default mode). Opens a file for reading, raises an error if the file does not exist.
- "w": Write. Opens a file for writing (creates a new file or overwrites the existing content).
- "a": Append. Opens a file for appending (adds new content without overwriting).
- "r+": Read and write.
- "w+": Write and read (overwrites the existing content).
- "a+": Append and read.

Example:

```
file = open("example.txt", "w")  # Open file for writing
file.write("Hello, world!")      # Write to the file
file.close()                     # Close the file
```

Reading a File

You can read a file using the read(), readline(), or readlines() methods.

- **read()**: Reads the entire file.
- **readline()**: Reads one line at a time.
- **readlines()**: Reads all lines and returns a list of strings.

Example: Reading a File

```
file = open("example.txt", "r")
content = file.read()  # Read entire file
print(content)
file.close()
```

Example: Reading Line by Line

```
file = open("example.txt", "r")
line = file.readline()  # Read one line
while line:
    print(line.strip())  # Strip to remove trailing newline
    line = file.readline()
file.close()
```

Writing to a File

When writing to a file, you can use the write() method. If the file doesn't exist, it will be created. If it does exist, the content will be overwritten in "w" mode.

Example:

```
file = open("example.txt", "w")
file.write("This is a new line of text.")
file.close()
```

Appending to a File

When you want to add data to the end of an existing file without overwriting its content, use the "a" mode.

Example:

```
file = open("example.txt", "a")
file.write("\nAppending a new line.")
file.close()
```

Deleting a File

To delete a file, use the os module.

Example:

```
import os
if os.path.exists("example.txt"):
    os.remove("example.txt")
else:
    print("The file does not exist")
```

File Methods Overview

- **open()**: Opens a file for reading or writing.
- **read()**: Reads the entire file content.
- **readline()**: Reads a single line from the file.
- **readlines()**: Reads all lines from the file and returns them as a list.
- **write()**: Writes content to the file.
- **writelines()**: Writes a list of strings to the file.
- **close()**: Closes the file.

Example use case:

Updating server config path value:

- This script opens the `server.conf` file in read mode and stores its content in a list. It then reopens the file in write mode, searches for the specified keyword provided in the function definition, and updates the corresponding values based on the input given in the function.

```python
def update_server_config(file_path, key, value):
    # Read the existing content of the server configuration file
    with open(file_path, 'r') as file:
        lines = file.readlines()

    # Update the configuration value for the specified key
    with open(file_path, 'w') as file:
        for line in lines:
            # Check if the line starts with the specified key
            if key in line:
                # Update the line with the new value
                file.write(key + "=" + value + "\n")
            else:
                # Keep the existing line as it is
                file.write(line)

# Path to the server configuration file
server_config_file = 'server.conf'

# Key and new value for updating the server configuration
key_to_update = 'MAX_CONNECTIONS'
new_value = '600'  # New maximum connections allowed

# Update the server configuration file
update_server_config(server_config_file, key_to_update, new_value)
```

Day-13
Boto3 Overview

- Boto3 is the Amazon Web Services (AWS) Software Development Kit (SDK) for Python.
- It allows Python developers to write code that interacts with various AWS services such as S3, EC2, DynamoDB, and more.
- Boto3 provides both low-level service access and higher-level resource abstractions to make it easier to work with AWS.

Installing Boto3

Before using Boto3, you need to install it via pip:

```
pip install boto3
```

Configuring Boto3

Boto3 can be configured using the AWS CLI credentials, or by manually specifying credentials in the code.

AWS CLI Configuration

If you've installed and configured the AWS CLI, Boto3 will automatically use those credentials. You can configure the AWS CLI by running:

```
aws configure
```

This will prompt you to provide:

- AWS Access Key ID
- AWS Secret Access Key
- Default Region Name
- Default Output Format (e.g., json)

Session, Client, and Resource

- **Client**: Provides low-level access to AWS services. Every operation requires more manual handling, and the response is returned in a dictionary format.

```
s3 = boto3.client('s3')
```

- **Resource**: Provides higher-level, object-oriented abstractions. It's easier to use for common tasks but not available for all AWS services.

  ```
  s3 = boto3.resource('s3')
  ```

- **Session**: Allows you to manage multiple AWS configurations.

  ```
  session = boto3.Session(aws_access_key_id='KEY',
  aws_secret_access_key='SECRET')
  s3 = session.client('s3')
  ```

Example: Uploading Files to S3

- creating a new S3 bucket, uploading a file to it, and then listing the files in the bucket:

```
import boto3

# Create an S3 client
s3 = boto3.client('s3')

# Create a new bucket
s3.create_bucket(Bucket='my-new-bucket')

# Upload a file to the bucket
s3.upload_file('local_file.txt', 'my-new-bucket', 'file_in_s3.txt')

# List files in the bucket
response = s3.list_objects_v2(Bucket='my-new-bucket')
for obj in response.get('Contents', []):
    print(obj['Key'])
```

In DevOps world we can use this to create the AWS resources, Cost Optimizations etc.

Day-14 & 15
JIRA & GitHub Integration

Use Case:

Creating automatic JIRA ticket from GitHub.

Steps to be followed:

- Create JIRA login
- JIRA API Calls
- Create the GitHub workflow to integrate with JIRA
- Run the python Application

List JIRA Projects Script:

```
# This code sample uses the 'requests' library:
# http://docs.python-requests.org
import requests
from requests.auth import HTTPBasicAuth
import json

url = "https://mdsajid020.atlassian.net/rest/api/3/project"

API_TOKEN="ajljagpoelgaldsjglajljaljsdglajdlfgjaljlsdjbvlajbl"

auth = HTTPBasicAuth("mdsajid020@gmail.com", API_TOKEN)

headers = {
  "Accept": "application/json"
}

response = requests.request(
   "GET",
   url,
   headers=headers,
   auth=auth
)

output = json.loads(response.text)

name = output[0]["name"]

print(name)
```

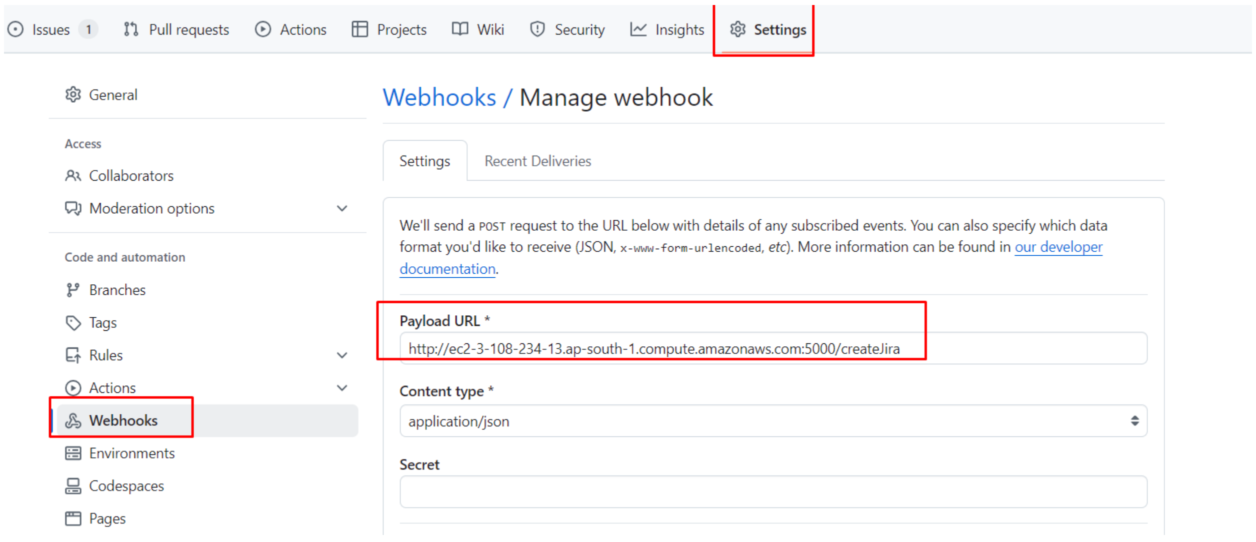
Create JIRA Script:

```
# This code sample uses the 'requests' library:
# http://docs.python-requests.org
import requests
from requests.auth import HTTPBasicAuth
import json

url = "https://mdsajid020.atlassian.net/rest/api/3/issue"

API_TOKEN = "ATATT3xFfGF0FEN7BU7iVpTd3sIa7AOUXX18wWO"

auth = HTTPBasicAuth("mdsajid020@gmail.com", API_TOKEN)

headers = {
  "Accept": "application/json",
  "Content-Type": "application/json"
}

payload = json.dumps( {
  "fields": {
    "description": {
      "content": [
        {
          "content": [
            {
              "text": "My first jira ticket",
              "type": "text"
            }
          ],
          "type": "paragraph"
        }
      ],
      "type": "doc",
      "version": 1
    },
    "project": {
      "id": "10000"
    },
    "issuetype": {
      "id": "10001"
    },
    "summary": "First JIRA Ticket",
  },
  "update": {}
} )

response = requests.request(
   "POST",
   url,
   data=payload,
   headers=headers,
   auth=auth
)

print(json.dumps(json.loads(response.text), sort_keys=True, indent=4,
separators=(",", ": ")))
```

Final Python App using flask:

```
# This code sample uses the 'requests' library:
# http://docs.python-requests.org
import requests
from requests.auth import HTTPBasicAuth
import json
from flask import Flask

app = Flask(__name__)

# Define a route that handles GET requests
@app.route('/createJira', methods=['POST'])
def createJira():

    url = "https://mdsajid020.atlassian.net/rest/api/3/issue"

    API_TOKEN="ATATT3xFfGF0FEN7BU7iVpT"

    auth = HTTPBasicAuth("mdsajid020@gmail.com", API_TOKEN)

    headers = {
        "Accept": "application/json",
        "Content-Type": "application/json"
    }

    payload = json.dumps( {
        "fields": {
        "description": {
            "content": [
                {
                    "content": [
                        {
                            "text": "Order entry fails when selecting 
supplier.",
                            "type": "text"
                        }
                    ],
                    "type": "paragraph"
                    }
                ],
            "type": "doc",
             "version": 1
        },
        "project": {
           "id": "10000"
        },
        "issuetype": {
            "id": "10001"
        },
        "summary": "Main order flow broken",
    },
    "update": {}
    } )


    response = requests.request(
        "POST",
        url,
        data=payload,
        headers=headers,
        auth=auth
    )

    return json.dumps(json.loads(response.text), sort_keys=True, indent=4, 
separators=(",", ": "))

if __name__ == '__main__':
    app.run(host='0.0.0.0', port=5000)
```

Need to configure this application URL in the GitHub Webhook section. Refer snapshot



Webhooks / Manage webhook

We'll send a `POST` request to the URL below with details of any subscribed events. You can also specify which data format you'd like to receive (JSON, `x-www-form-urlencoded`, *etc*). More information can be found in our developer documentation.

Payload URL *
http://ec2-3-108-234-13.ap-south-1.compute.amazonaws.com:5000/createJira

Content type *
application/json

Secret

Day-16
Basic Interview Questions

Q1. Describe a real-world example of how you used Python to solve a DevOps challenge.

- Here you can talk about the projects that we did in this series
    - GitHub Webhooks
    - JIRA integration
    - File Operations

Q2. Discuss the challenges that you faced while using Python for DevOps and how did you overcome it.

- Here you can mention about a challenge that you faced while implementating a Python project for DevOps that we learnt.

Q3. How can you secure your Python code and scripts?

- Handle any sensetive information using Input variables, command line arguments or env vars.

Q4. Explain the difference between mutable and immutable objects.

In Python, mutable objects can be altered after creation, while immutable objects cannot be changed once created. For instance:

Mutable objects like lists can be modified:

```
my_list = [1, 2, 3]
my_list[0] = 0  # Modifying an element in the list
print(my_list)  # Output: [0, 2, 3]
```

Immutable objects like tuples cannot be altered:

```
my_tuple = (1, 2, 3)
# Attempting to change a tuple will result in an error
# my_tuple[0] = 0
```

Q5. Differentiate between list and tuple in Python.

Lists are mutable and typically used for storing collections of items that can be changed, while tuples are immutable and commonly used to store collections of items that shouldn't change. Examples:

List:

```
my_list = [1, 2, 3]
my_list.append(4)  # Modifying by adding an element
print(my_list)  # Output: [1, 2, 3, 4]
```

Tuple:

```
my_tuple = (1, 2, 3)
# Attempting to modify a tuple will result in an error
# my_tuple.append(4)
```

Q6. Explain the use of virtualenv.

Virtualenv creates isolated Python environments, allowing different projects to use different versions of packages without conflicts. Example:

Creating a virtual environment:

Creating a virtual environment named 'myenv'

```
virtualenv myenv
```

Activating the virtual environment:

On Windows

```
myenv\Scripts\activate
```

On Unix or MacOS

```
source myenv/bin/activate
```

Q7. What are decorators in Python?

Decorators modify the behavior of functions. They take a function as an argument, add some functionality, and return another function without modifying the original function's code. Example:

Defining a simple decorator:

```
def my_decorator(func):
    def wrapper():
        print("Something is happening before the function is called.")
        func()
        print("Something is happening after the function is called.")
    return wrapper

@my_decorator
def say_hello():
    print("Hello!")

say_hello()
```

Q8. How does exception handling work in Python?

Exception handling in Python uses try, except, else, and finally blocks. Example:

Handling division by zero exception:

```
try:
    result = 10 / 0
except ZeroDivisionError:
    print("Division by zero is not allowed.")
else:
    print("Division successful:", result)
finally:
    print("Execution completed.")
```

Q9. What's the difference between append() and extend() for lists?

append() adds a single element to the end of a list, while extend() adds multiple elements by appending elements from an iterable. Example:

Using append():

```
my_list = [1, 2, 3]
my_list.append(4)
print(my_list)  # Output: [1, 2, 3, 4]
```

Using extend():

```
my_list = [1, 2, 3]
my_list.extend([4, 5])
print(my_list)  # Output: [1, 2, 3, 4, 5]
```

Q10. Explain the use of lambda functions in Python.

Lambda functions are anonymous functions used for short tasks. Example:

Defining and using a lambda function:

```
square = lambda x: x**2
```

```
print(square(5))  # Output: 25
```

Q11. What are the different types of loops in Python?

Python has for loops and while loops.

Example:

Using for loop:

```
for i in range(5):
    print(i)
```

Using while loop:

```
i = 0
while i < 5:
    print(i)
    i += 1
```

Q12. Explain the difference between == and is operators.

The == operator compares the values of two objects, while the is operator checks if two variables point to the same object in memory.

Example:

Using ==:

```
a = [1, 2, 3]
b = [1, 2, 3]
print(a == b)  # Output: True (because values are equal)
```

Using is:

```
a = [1, 2, 3]
b = a
print(a is b)  # Output: True (because they reference the same object)
```

Q13. What is the use of the pass keyword?

The pass keyword is a no-operation placeholder used when a statement is syntactically needed but no action is required. Example:

Using pass:

```
def placeholder_function():
    pass  # To be implemented later
```

Q14. What is the difference between global and local variables?

Global variables are defined outside functions and can be accessed anywhere in the code, while local variables are defined inside functions and are only accessible within that function's scope. Example:

Using a global variable:

```
global_var = 10

def my_function():
    print(global_var)

my_function()  # Output: 10
```

Using a local variable:

```
def my_function():
    local_var = 5
    print(local_var)

my_function()  # Output: 5
# Attempting to access local_var outside the function will result in an error
```

Q15. Explain the difference between open() and with open() statement.

open() is a built-in function used to open a file and return a file object. However, it's crucial to manually close the file using file_object.close(). Conversely, with open() is a context manager that automatically handles file closure, ensuring clean-up even if exceptions occur.

Example:

```
file = open('example.txt', 'r')
content = file.read()
file.close()
```

Using with open():

```
with open('example.txt', 'r') as file:
    content = file.read()
# File is automatically closed when the block exits
```