# Phase 3: Report Submission

server less IOT data processing:

Introduction:

The Internet of Things (IoT) has revolutionized the way we collect and process data from connected devices. Building a serverless IoT data processing solution using IBM Cloud Functions offers a scalable and cost-effective approach to handle the influx of data from various IoT devices. This report outlines the key components and steps to create such a solution.
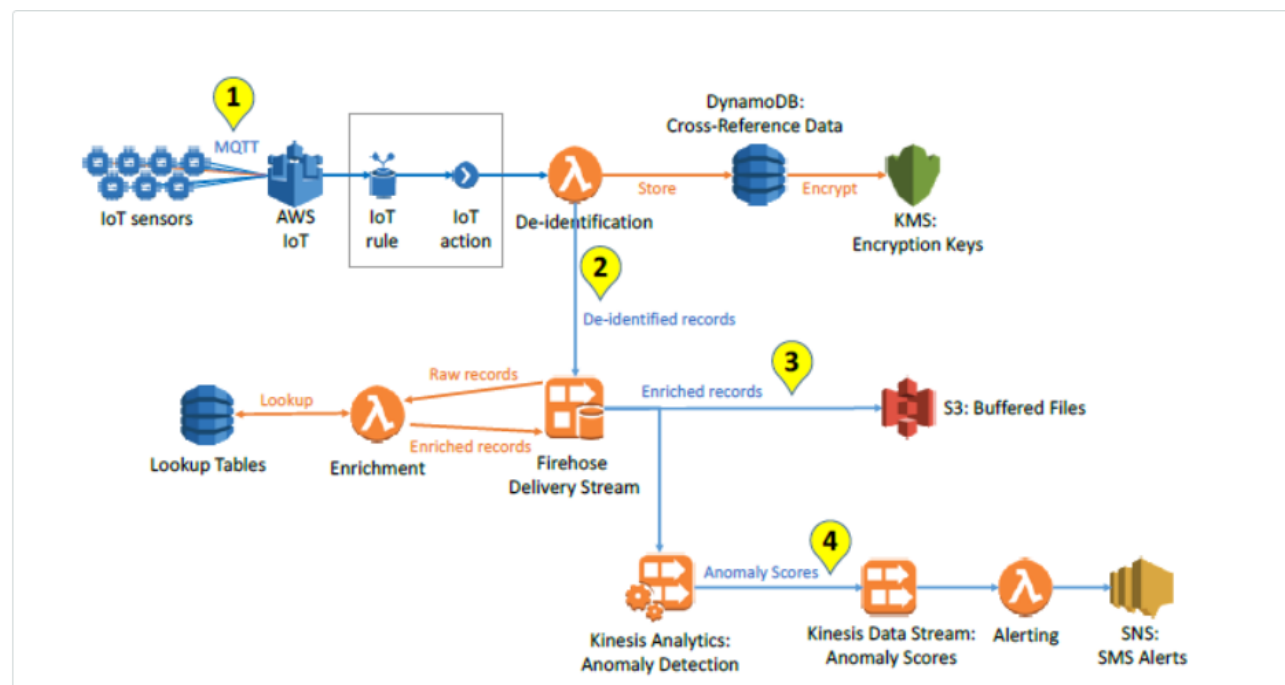
I. Overview of Server Less Architecture:

- Serverless computing eliminates the need for managing server infrastructure and allows developers to focus on code execution.
- IBM Cloud Functions is an event-driven, serverless compute platform that can be used to process IoT data efficiently.

II. Device Integration:

- IoT devices, such as sensors and actuators, need to be integrated into the solution.
- IoT device data can be collected using MQTT, HTTP, or other IoT protocols.
- Data should be sent to an IoT platform for ingestion, such as IBM Watson IoT Platform.

III. Data Ingestion:

- IBM Watson IoT Platform can be used to ingest data from devices.
- It provides tools for device management, security, and data routing.

- Data can be stored in a cloud-based database or data lake for further processing.

IV. Data Processing with IBM Cloud Functions:

- IBM Cloud Functions can be triggered by events, such as new data arriving in the IoT platform.
- Use IBM Cloud Functions to process incoming data in a serverless environment.
- Functions can be written in various programming languages, and third-party libraries can be used.

V. Data Transformation and Analysis:

- IBM Cloud Functions can transform and analyze IoT data in real-time.
- Perform data filtering, aggregation, and enrichment.
- Utilize serverless functions to trigger alerts or notifications based on predefined rules.

VI. Data Storage and Visualization:

- Processed data can be stored in databases or cloud storage services.
- Visualization tools or dashboards can be used to gain insights from the data.
- IBM Cloud services, like Cloudant or Db2, can be used for data storage.

VII. Scalability and Cost-Efficiency:

- Serverless architecture automatically scales based on demand, reducing operational costs.
- Pay only for the actual compute resources used during execution.

VIII. Security:

- Implement proper security measures for device communication, data storage, and function execution.
- Use encryption, access controls, and authentication.

iX. Dataset:

```
Date,Product,Revenue,Quantity
2023-10-01,Product A,500,10
2023-10-02,Product B,300,5
2023-10-03,Product A,700,14
```

```
2023-10-03,Product A,700,14
2023-10-04,Product C,250,8
2023-10-05,Product B,400,7
2023-10-06,Product A,600,12
```

X. Code:

```python
import pandas as pd

# Read the dataset
df = pd.read_csv('sales_data.csv')

# Display the first few rows of the
dataset
print(df.head())

# Calculate total revenue
total_revenue = df['Revenue'].sum()
print(f"Total Revenue: ${total_revenue}")

# Calculate average revenue
average_revenue = df['Revenue'].mean()
print(f"Average Revenue: $
{average_revenue:.2f}")

# Group by product and calculate total
revenue for each product
product_revenue = df.groupby('Product')
['Revenue'].sum()
print("\nProduct-wise Revenue:")
print(product_revenue)

# Save the results to a new CSV file
product_revenue.to_csv('product_revenue.c
sv', header=True)

# Plot a bar chart of product-wise
```

```
# Plot a bar chart of product-wise
revenue
import matplotlib.pyplot as plt
product_revenue.plot(kind='bar',
title='Product-wise Revenue')
plt.ylabel('Revenue')
plt.show()
```

conclusion:

A serverless IoT data processing solution with IBM Cloud Functions offers an efficient and cost-effective approach to handling large volumes of data from IoT devices. By integrating devices, ingesting data, processing it with serverless functions, and implementing security measures, organizations can gain valuable insights and drive data-driven decisions in a scalable and reliable manner. This approach provides flexibility and agility for managing IoT data, making it a powerful solution for various IoT applications.