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Cloud Monitoring System Using Internet of Things

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Abstract **–** Cloud Based IoT Monitoring System .We will monitor AWS services such as ec2 and see if they are over their data limits as per our alarm criteria in this project. If cloud resources exceed our data limit, we can receive an alarm from our IoT device. In the alert system, we will utilise the sns service to send an emai to our preferred email address, and then use the aws eventbridge service to activate lambda. We can write a.py (python script) and host it in Lambda using our own custom layer to integrate the libraries required by the script. We can use Api to deliver signals to IoT devices. We can also leverage AWS capabilities like cloudwatch and lambda to monitor events and notify our IoT devices. We'll also look at cloud architecture and how it interacts with IoT devices. Cloud computing is the next step in the evolution of internet-based computing, and it enables the use of information technology as a service. The Internet of Things (IoT) can improve efficiency, performance, and throughput as smart devices move outside of the cloud infrastructure environment.

INTRODUCTION

In Cloud Services. sometimes our services exceed the expected level and. Data security also has your concerns about cloud protection. IoT-based system can be used to get instant information . Using both IoT with cloud we can effectively monitor our cloud for any activity . We can also use cloud to monitor our IoT device . using dual side connection we can create Cloud-IoT architecture . in this project we plan to connect IoT and cloud via Api and using cloud resources. Cloud computing is the next step in the growth of internet-based computing, It enables the delivery of information and communication technology (ICT) services over a network .

In the cloud infrastructure, IoT can benefit from increased efficiency, efficiency, and payload. IoT is very concerned with challenges from a dynamic and shared environment. IoT is a broad category that combines a variety of flexible and unconventional devices with limited storage, power supplies, and performance capabilities. These barriers create barriers and distractions in the development of IoT systems, and cover complex issues such as compatibility, efficiency, full functionality, and availability. One of the most promising ways to integrate with IoT is to overcome such limitations is cloud computing.

Problem Statement

Resource management, which assures optimal resource use, load balancing, avoids SLA violations, and improves system performance by minimising operational costs and energy consumption, is one of the primary challenges of Cloud-based IoT environments.

Problems:

Problem: Security Issue On premises

Solution:

cloud providers like aws automatically provides security to its services along with feature like KMS(key management service) to further improve . it also tell is there is any open ports or not

Problem: Scalability Issue

Solution:

if we are getting large amount of data traffic we can use features like autoscale which can easily help for scaling vm’s

Problem: Monitoring Services

Solution:

We can monitor cloud resources on aws with the help of cloud watch. we can also control out IoT with custom script or with IoT feature provided by aws

EXISTING SYSTEM

This study proposes an IoT-based cloud monitoring system for high-voltage power distribution rooms in electric substations as a typical pioneer project against the backdrop of China's emerging smart grids and ubiquitous

electric Internet of Things (UEIoT). Perception, network, and application layers are all part of this system. The key technologies that contribute to the realisation of real-time automatic control, intelligent regulation, online analysis, and decision-making are detailed. The suggested IoT-based cloud monitoring system has been tested in numerous regions around Hunan Province, and the results demonstrate the system's benefits in terms of lowering human labour, increasing efficiency, and averting accidents.

PROPOSED SYSTEM

The proposed system is a cloud-based IoT module that will receive the signal from Endpoints and cloud-based scripts and send an alert. When there is an anomaly. It will take a look out for service overload. We may also use the cloud to operate our IoT module. We can use a python file and run it in an ec2 (virtual machine used for computing) to do various tasks on our IoT device remotely. If the consumption of a cloud resource, such as the CPU, exceeds a specific level, an alarm will be triggered in cloud watch, which will send a sns and email alert. The eventbridge will send a request to our IoT module, and the led indicator will light up. In future Iot and Cloud both will work seamlessly and autonomously without much human intervention

IMPLEMENTATION

This project "**Cloud Monitoring System Using IoT**" was made possible by using aws platform and boult IoT device **.** i already had an IoT device around me called boult IoT module . we can connect multiple modules to IoT device and see their functionality . I also knew aws (cloud service provided by amazon) . so I deployed my project on aws itself using various aws services .

It took ample amount of time to research about both IoT and cloud , and figuring out which aws service would I require for my project . since many aws services provide similar features

Implement Process:-

we will upload a static file to s3 then connect it to ec2 and use cloudwatch to send alert to lambda which will trigger our IoT device . we can also control out IoT device feature from cloud itself or any local or remote machine

Creation Process:-

In this section, I'll go over the process in further detail. We'll put an html file on S3.

With an IAM role, connect s3 to ec2. Then we'll use cloudwatch to monitor ec2.

We'll set up an alert to keep track of the data we've collected. When an alarm is triggered, a sns (simple notification service) is sent to the email address specified. After that, we'll use the eventbridge service to call lambda. Lambda will be set up with a custom layer and a.py (python file) that will activate the IoT device.

We may also connect our IoT device to the cloud by utilising a.py(python) script that interacts with the IoT API and allows us to execute a variety of operations on it. This script can be run on ec2, localmachine, or any remote computer.

Amazon EC2 (Elastic Compute Cloud):-

EC2 stands for Elastic Compute cloud. It is Access reliable, scalable infrastructure on demand. With a 99.99 percent availability SLA, you can scale capacity in minutes.. It can run cloud native apps . we can covert over localmachine application to cloud application by availing services proviced by ec2

Feature of ec2 are

- Storage
- Networking
- Operating Systems and Software program

Amazon S3 (Cloud Object Storage):-

S3 refers to Amazon's basic storage service. Static data, photos, video, and backup logs are the usecase of the system. There is no limit to the amount of storage available, and it has a very long lifespan (99.999999999). Scalability, data availability, security, and performance are all industry-leading features of the s3 service.S3 have many types that suit the need of its user

Types of s3 are

Amazon S3 Standard, S3 Standard-Infrequent Access, S3 Intelligent-Tiering, S3 Glacier Instant Retrieval, S3 Glacier Flexible Retrieval

Some attributes of s3 are :-

- Storage analytics and insights
- Access management and security
- Data processing
- Data transfer
- Query in place
- Performance

Amazon IAM (Identity Access Management):-

Identity Access Management is abbreviated as IAM. This is the master account as well as the root account. It has full access to all Amazon Web Services (AWS) services. Iam can be used to give aws services or other users on the same account access to resources. when the iam role is assigned to the users/service Then they are granted authorization based on their jobs.

IAM roles

An IAM role is a specific permissioned IAM identity that you can create in your account. In the same way that an IAM user is an AWS identity, an IAM role is an AWS identity with permission policies that define what the identity can and cannot do in AWS. A role, on the other hand, is meant to be assumable by anyone who requires it, rather than being connected with a single person. A job also does not have any long-term credentials connected with it, such as a password or access keys. Instead, when you take on a role, you are given temporary security credentials for the duration of your role session.

Lambda

AWS Lambda is Amazon's event-driven, serverless computing technology, which is part of Amazon Web Services. It's a computing service that runs code in response to events and maintains the computing resources needed by that code autonomously. The code does not require a server to execute. Free-tier users get 1 million requests for lambda free.

Python

Python is a interpreted high-level object-oriented general-purpose programming language. Its design prioritize code readability and makes extensive use of indentation. Its language elements and object-oriented approach are aimed at assisting programmers in writing clear, logical code for both small and large projects. We use Python to communicate with and control our IoT device via the cloud

EventBridge

Amazon EventBridge is a serverless event bus that makes it easy to develop event-driven applications at scale using events provided by your apps, SaaS apps, and AWS services. You can use routing instructions to stipulate where your data should be sent, allowing you to create application architectures that react in real time to your data sources, with the event publisher and consumer totally decoupled.

Sns (Simple Notification Service)

The Amazon Simple Notification Service (Amazon SNS) is a fully managed messaging service for both A2A and A2P communication. Topics for high-throughput, push-based, many-to-many messaging across distributed systems, microservices, and event-driven serverless applications are provided by the A2A pub/sub capabilities. The A2P functionality enables you to send messages to users at scale via SMS, mobile push, and email.

Sqs (Simple Queue Service)

SQS (Amazon Simple Queue Service) is a totally controlled message queuing provider for decoupling and scaling microservices, dispensed systems, and serverless applications. SQS gets rid of the complexity and overhead of handling and working message-orientated middleware, permitting builders to pay attention on. You can also additionally send, store, and get hold of messages throughout software program additives the usage of SQS at any quantity with out dropping messages or necessitating the provision of different services. Using the AWS Management Console, your chosen Command Line Interface or SDK, and 3 commands, you may get commenced with SQS in minutes.

CloudWatch

Amazon CloudWatch is Used by DevOps engineers, developers, site reliability engineers (SREs), IT managers, and product owners can use this monitoring and observability solution. To monitor your apps, respond to system-wide performance changes, and optimise resource use, CloudWatch offers you with data and actionable insights. CloudWatch logs, metrics, and events are used to collect monitoring and operational data. You obtain total visibility of your AWS resources, apps, and services running on AWS and on-premises, as well as a single picture of operational health.

Benefits of CloudWatch are

- Use a single platform for observability
- Collect metrics on AWS and on premises
- Improve operational performance and resource optimization
- Get operational visibility and insight
- Derive actionable insights from logs

CloudWatch alarms

You can create both *metric alarms* and *composite alarms* in CloudWatch.

A single CloudWatch metric or the output of a math expression based on CloudWatch metrics is monitored by a metric alarm. Based on the value of the metric or expression relative to a threshold over a number of time periods, the alarm takes one or more actions. Sending a notification to an Amazon SNS topic, running an Amazon EC2 action or an Amazon EC2 Auto Scaling action, or creating an Ops Item or incident in Systems Manager are all examples of actions.

A rule expression in a composite alarm takes into account the alarm states of previous alarms you've generated. Only if all of the rule's prerequisites are met does the composite alarm go into ALARM mode. Metric alarms and other composite alarms can be expressed in a composite alarm's rule expression. There is no limit to how many alerts you can set in your account.

Alarms can be added to CloudWatch dashboards and visually monitored. When an alarm is in the ALARM state, it becomes red on the dashboard, making it easier for you to keep track of its condition.

When the condition of an alarm changes, actions are triggered. Alarms with Auto Scaling actions are an exception. The alarm continues to invoke the action once each minute that the alarm remains in the new state for Auto Scaling activities.

Security Group

A security group acts as a virtual firewall, controlling the traffic that is allowed to reach and leave the resources that it is associated with. For example, after you associate a security group with an EC2 instance, it controls the inbound and outbound traffic for the instance.

We will use http port 80
And ssh port 22

KMS (Key Management Service)

AWS Key Management Service (AWS KMS) makes it simple to create, manage, and control cryptographic keys across a variety of AWS services and in your applications. AWS KMS is a safe and dependable service that protects your keys with hardware security modules that have been validated under FIPS 140-2 or are in the process of being validated. AWS KMS and AWS CloudTrail are connected to provide you with logs of all key usage to help you satisfy regulatory and compliance requirements.

Putty

PuTTY is a terminal emulator, serial console, and network file transfer tool that is free and open-source. SCP, SSH, Telnet, rlogin, and raw socket connections are among the network protocols it supports. It also has the ability to connect to a serial port.

Elastic Block Store (EBS)

Amazon Elastic Block Store (Amazon EBS) is a high-performance block storage service built for Amazon Elastic Compute Cloud that is simple to use and scale (Amazon EC2).

LITERATURE SURVEY

Data security in cloud computing

The increased use of cloud computing for data storage is undoubtedly accelerating the trend of better cloud data storage methods. If data stored in the cloud is not properly protected, it may be at risk.

Smart Bulb for IoT

It was feasible to create an intelligent bulb based on the internet of things concept, whose activation could be done from anywhere in the globe with internet access, and the bulb's location was not connected to a specific location.

Evaluation of Internet of Things (IoT) and its impacts on Global Supply Chains

The article has focused on the impacts of the IoT on SCM. Firstly, it referred to its main characteristics, the way it appeared in industry and the way it functions and develops. Unquestionably there is an intense conversation about its revolutionary character and penetration in the world's industries and markets' domain. Consequently, its

impacts are numerous, since it has pervaded in supply chain's sector imposing changes and new ways of operation.

AWS Lambda Language Performance

The main objective of this thesis was to conduct a benchmark and evaluate the performance of the following languages on the AWS Lambda platform: C#, Java, Node.js,and Python. Additionally, technologies were used to aid and easy testing and deployment. The Serverless Framework aided development and deployment of functions.

IoT Challenges

What becomes clear in these challenges is that IoT cannot be managed with the current policy tools and research programs. They are too slow and too instrumental. There is too little sense of urgency; of the larger picture of Climate Change that should be the one issue The key umbrella research topics are parsed to, as well as the impending collapse in inclusively regulating social drivers.

Cloud Based IoT Architecture

Developing an IoT application on a cloud platform requires thoroughly understanding the programming API, configuration, performance, limitation, and design patterns of the tools of the platform. In this thesis, we reviewed the different aspects required to create a Cloudbased IoT system, such as device clients, gateways, IoT communication protocols, storage, analysis, and visualization using many of the tools from Azure as examples. Following the requirements and design patterns for a cloud- based IoT system

Ultra-Low-Power Sensors and Receivers for IoT Applications

This dissertation describes the breakthroughs made to the receivers and sensors that integrate wireless connections into everything by achieving nano-watt power consumption and millimeter area occupation.

Cloud Implementation and Cloud Integration

The cloud service engineering is a new engineering discipline for the development and delivery of cloud computing services. It is important to follow a life cycle model for engineering a cloud. Cloud development life cycle is the one of the available model for this purpose

An IoT Based Real-Time Environmental Monitoring System Using

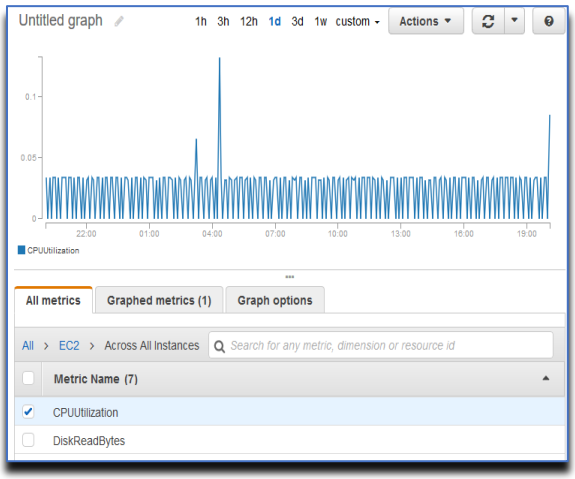
Arduino and Cloud Service

This paper presents an environmental monitoring system for real-time monitoring of temperature and humidity of surrounding environment. The sensed data is sent through Wi-Fi to the cloud where both real-time data and its graphical analyses can be viewed

Challenges: Bridge between Cloud and IoT

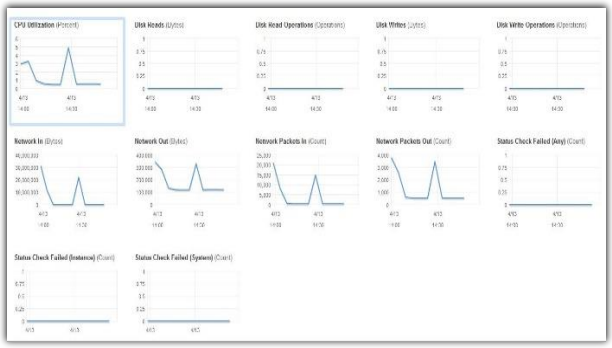
Internet of Things continues to prove its important position in IT and communications and further development in the community. While the fundamental concepts and underpinnings have been thoroughly explained and have attained maturity, more work is required to fully realise its potential and consolidate it.

Ec2 cpu utilization graph



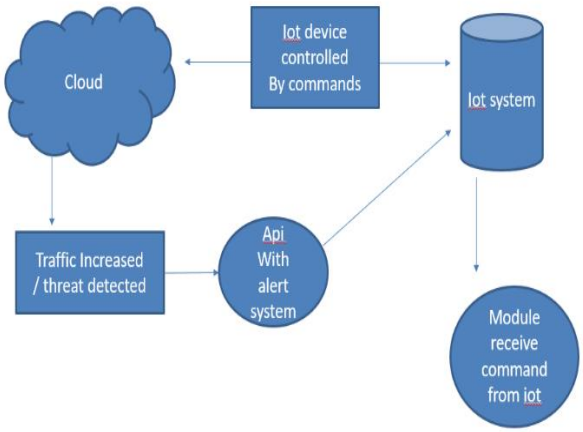
This graph shows ec2 cpu utilization levels using which we can take action on if it exceed a level example level 3 is exceeded then we will use alert feature of cloud watch to send notification after that we will use event bridge to triger lambda and trigger out Iot device

Other ec2 Metrics

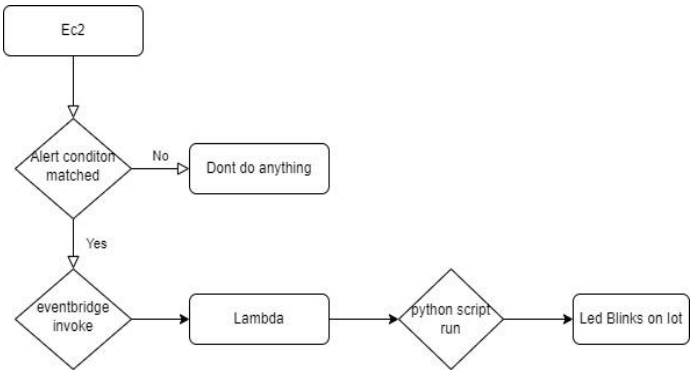


We can also track and monitor other ec2 metric as mentioned in image

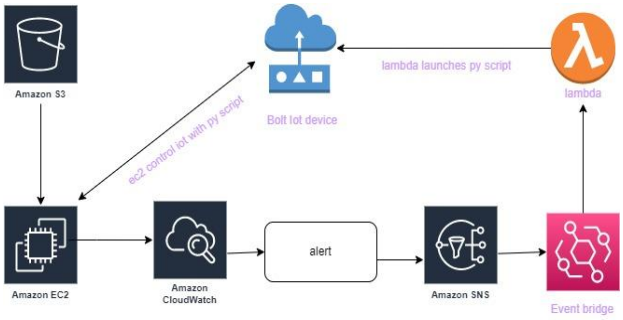
Cloud IoT Communication



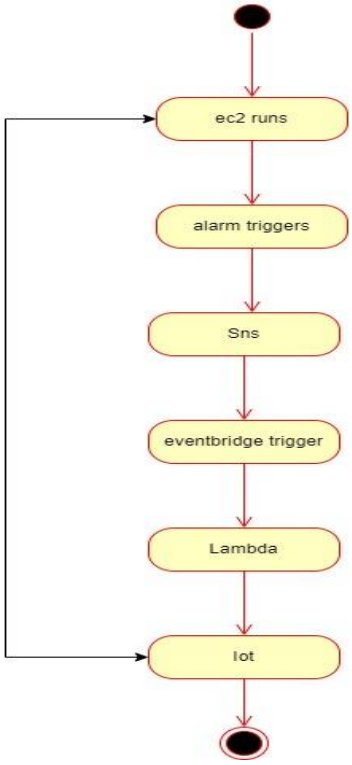
DFD (Data Flow Diagram)



System Design



Activity Diagram



Conclusion

We conclude that IoT and cloud working together can create an unique ecosystem . And will lead to more evolving technologies . Cloud implementation and cloud integration is essential also we must take note of any challenges in configuring IoT and cloud both . Therefore, in the future we can communicate more easily and seamlessly between them.

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