

Study of IOT Application using Cellular Network & Cloud Developing

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Received on: 11 June ,2022

Revised on: 06 August ,2022,

Published on: 09 August ,2022

Abstract –The Internet of Things (IOT) is a type of network that connects various devices over the Internet. IOTs are useful for transferring data between devices, tracking and monitoring devices, and more. DevOps is the practice of operations and development engineers who collectively participate in the entire service life cycle, from design to development processes to production support for normal purposes. Cloud computing provides on-demand, convenient, and scalable network access that enables sharing of computing resources. Their acceptance and use are expected to continue, to grow and become an important part of the Internet. 5G describes key phases of mobile communication standards that will exceed 4G standards in the future. 5G technology is constantly changing the way most high-bandwidth users access their smart phones.

Keywords – Internet of Things, Dev Ops, Cloud Computing, 5G.

I- INTRODUCTION

The Internet of Things (IOT) features interconnected computing devices, machines, and digital machines, objects, or unique identifiers that allow you to send data over the wholenetwork without any personal contact. It is a human system with the ability to perform or requires human-computer interactions. DevOps is the solution for software developers, quality assurance engineers, and system administrators. DevOps refers to an organizational approach, culture, and motion centered on

faster, higher-exceptional development, operational collaboration, and integration into merchandise and services [1].Cloud computing simplifies DevOps implementation by supporting every step of the development life cycle. 5G technology enables cloud service providers to reach enterprise mobile customers in an easy and reliable way. With the improved computer-to-machine and machine-to-machine communication provided by 5G, access to virtual machines over the telephone is becoming more widespread. 5G networks help to prevent privacy, confidentiality, security, traffic integrity, stored data availability, network integrity, and attacks that can compromise confidentiality [2].

The Internet of Things (IOT) is growing as the number of connected devices is expected to grow from 700 million to 3.2 billion by 2023. There are several factors that have contributed to this increase, but one of the most important is the development of 5G networks. The upcoming 5th generation cellular or 5G is great news for the IOT market. This is primarily because 5G networks can greatly help improve the performance and reliability of these connected devices. 5G cellular enables faster access to the network with low latency and high dependability. In this way, the data reaches the server without latency and more devices can connect to the cellular network [3].

Both cloud computing and DevOps have so many benefits for providing a global dimension for agile enterprises. Cloud generation ensures that enterprises

have access to a myriad of features and answers at the right speed. With the cloud, there is no limit to the number of features that businesses can directly access. Cloud technology makes it easy to extend functionality in any environment. Cloud computing is primarily Internet-based full computing, accessing shared resources and using them in convenient "prepaid" ways to make calls [4]. Cellular networks have great features: high-speed, high-capacity voice and information communication networks with better multimedia and seamless roaming capabilities that support cellular devices.

II- METHODOLOGY

DevOps is an evolving philosophy and framework that encourages customers to improve their software faster, bigger, and quickly introduce new or revised software program features and products to their customers. "DevOps" this word is divided into two words, "Dev" and "Ops". "Dev" stands for "Development" and "Ops" stands for "Operations". This suggested data between "Dev" and "Ops" pervades all segments of the DevOps life cycle. From preliminary software program planning to code, build, testing, launch level, deployment, operations, and continuous monitoring. This data drives an uninterrupted loop of customer opinions with standardized adjustments, improvements, tests, and deployments. The end result of these efforts can be a particularly rapid and chronic introduction of adjustments or additions to key characteristics. DevOps games still struggle when dealing with statistics from heterogeneous environments. It's even more important to mix records rather than evaluate exceptional records [5].

There are some common DevOps practices that organizations can use to accelerate and improve development and product releases. They take the form of software development methods and practices. The most popular ones are as follows:

- **Scrum:** This refers to the type of software testing performed to verify the ability of software or applications to perform complex processes. It provides transparency, reviews, and tweaks during software development to avoid complexity.
- **Kanban:** A visually-driven project management model that focuses on continuous improvement and visibility of workflows. In simple words, the software testing which was done by the team's

Kanban had faced too many challenges for completing the development cycle faster, doing more, and achieving higher quality goals.

- **Agile:** It refers to a testing method in which the users have to follow the rules and principles of agile software development, for better communication, predictability, applicability etc. known as Agile.



Fig. 1-Internal block of typical IOT device

It runs on a battery that should last a long time. The physical layer needs to be slightly modified to convert the received sensor information into a format suitable for transmission over the cellular network. Both companies are committed to meeting the following key requirements for IOT devices to succeed in the market:

- The device battery should last a long time.
- The receiver should be more sensitive than a regular device.
- The entire battery system must be supported by a large number of devices.

TABLE 1-Class 0, Class 1, Class 2 for the restriction of IoT devices

Class	RAM	Flash	Description
Class 0	< 1 KB	< 100 KB	It is used by gateways for basic communication needs.
Class 1	Approx. 10 KB	Approx. 100 KB	It is used in the protocol stack according to the IOT device with CoAP. Interact with other devices without the need for a gateway.
Class 2	Approx. 50 KB	Approx. 250 KB	These devices support the regular IPV4 and IPV6 protocols. These work like any other network device.

It is really difficult to identify IOTs due to the heterogeneity of IOT devices, communication protocols, manufacturers, and control interfaces. Traditional encryption is not suitable for IOT devices due to resource limitations. However, lightweight encryption technology was used [6]. The DevOps implementation concept integrates development, operations, and testing departments into cross-functional teams with the goal of increasing the agility of IT service delivery as a whole. DevOps is so pervasive in the enterprise that it shortens the development cycle and incorporates automation. Testing with DevOps is paramount to ensuring the software quality of DevOps practices [7].

Although DevOps is carried out with exceptional variations in exceptional organizations, now no longer in an uncommon level of DevOps manner, the strategies are as follows:

- **Continuous Development** – It includes planning, sketching, and deploying new code. The main objective of continuous development is to streamline the code building process and reduce development-to-deployment time.
- **Continuous Integration (CI)** – This proves how far it takes a developer to integrate their code into a common repository.
- **Continuous Testing** – The goal of continuous testing is to accelerate the delivery of your code to your production environment. In this phase of DevOps, you update your application code while running pre-planned automated code testing. It refers to the proceeding of automatic software testing that runs continuously once the code is delivered by the developer. These tests are performed at all stages, from early development to software deployment.
- **Continuous Delivery** – This is the process that enables operations engineers and developers to push bug fixes, features, and configuration changes to produce faster. It offers the benefits of a code deployment pipeline that can be run on demand.
- **Continuous Deployment (CD)** – This refers to the continuation of continuous integration. It consists of automating deployment actions that were previously performed manually.
- **Continuous Monitoring** – It refers to the processes and technologies required to integrate monitoring into all phases of DevOps and the

IT operational life cycle. It helps to achieve results in the continuous health, performance, and reliability of your applications and infrastructure as you move from development to production.

III- DESIGN

IOT system design means the individual node devices and their protocols used to create a functioning IOT ecosystem. Each node device can perform tasks such as remote sensing and activation monitoring by relying on physically connected devices. You may also be able to send information using different types of wireless or wired connections. IOT applications are evolving regularly. However, the development of scalable, reliable, energy-efficient architectures and secure IOT systems remains a challenge in practice [8]. The features of the IOT system are used for the following purposes:

- Home connections
- Information processing
- Providing storage and interface

DevOps specialists streamline shipping through streamlining practices, enhancing conversation and collaboration, and developing automation. Design and enforce software node and infrastructure techniques that permit non-stop integration, testing, deployment, monitoring, and feedback.

The combination of 5G and cloud computing is a continuation of what cloud providers are already doing on content delivery networks. Software-defined networking (SDN) is a paradigm that allows users to separate both the control plane and the data plane in their network. SDN achieves this by extracting control plane functions from transmission devices such as switches and routers and centralizing these functions in the SDN controlling device [9]. These network services deliver content based on geographic location and rely on distributed servers to cache content close to end users. However, 5G supports the full range of new low-latency applications that require a distributed edge network to scale.

This architecture explains various building blocks that can solve IOT problems. This scenario focuses more on edge computing than on other proposed designs.

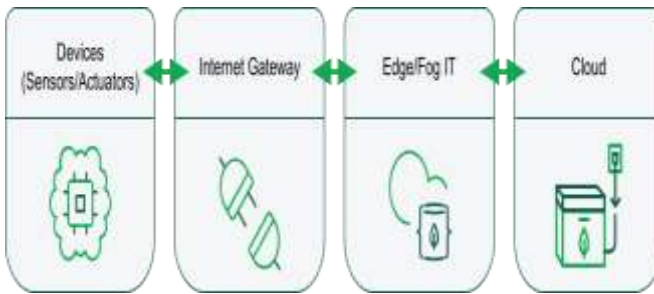


Fig. 2: Different phases of IOT architecture

- **Devices:**This phase is about the actual device of the IOT solution. These devices can be sensors or actuators in the sensory layer. The generated data is converted to digital format and sent to the Internet gateway stage. These devices are also known as sensors/actuators. Sensors collect data from the environment or what you are measuring and convert it into useful data. Actors can also intervene to change the physical conditions that generate the data.
- **Internet gateways:**The Internet gateway stage receives raw data from the device and pre-processes it before sending it to the cloud. This internet gateway can communicate with sensors over low power networks and physically connect to devices that can relay data to the internet or stand-alone devices.
- **Edge or fog computing:**See the Edge of Cloud Computing for the fastest possible processing of data. This layer typically processes only the latest data needed for time-sensitive operations. Edge IT processing systems can be located in remote offices or other edge locations, but are typically located within the facility or near sensors.
- **Cloud or data centre:**In this final phase, the data is saved for further processing. The application and business layers are in this phase and can provide dashboards or management software with data stored in the cloud. Data that requires more detailed processing and does not require immediate feedback is routed to a physical data centre or cloud-based system, allowing more powerful IT systems can analyse, manage, and securely store the data.

The three main layers of the IOT architecture are:

- **Perception:**This refers to the physical layer of the architecture. That's why this device is connected to the sensor and it helps to collect different amounts of data depending on the needs of the project. These can be edge devices, sensors, and actuators that interact with the environment.
- **Network:**This means data that needs to be collected, transmitted, and processed by all these devices. Connect these devices to other smart objects, servers, and network devices. It also handles the transmission of all data.
- **Application:**The application layer is what the user sees. This can be an application for controlling devices in a dashboard that displays the status of devices which is an important part of the system.

IV- CONCLUSION

The main objective of DevOps is not to make regular major releases, but to make various improvements in a short period of time. This process allows enterprises to seamlessly and efficiently create higher-quality software products. The term "DevOps" is also used to support a corporate culture that facilitates effective communication, collaboration, and integration between operations teams and diverse software developers. Cloud computing 5G sends data faster. 5G technology will be an important ally in the cloud to reach data storage and transmission goals with relatively few resources. 5G technology enhances the capabilities of cloud computing. Data services will be distributed to hotspots to meet the requirements of large-scale data communications. This is the future of 5G communications [10]. Cloud computing is a centralized system that helps you to detect, test, transfer and deliver data and files to your data centre all over the Internet. The Internet of Things (IOT) is a device that helps you to connect to the Internet through various features of the IOT gateway. For example, data caching, data pre-processing, device-to-device communication, etc. Not only does IOT collect data and store it in real-time, but it also retrieves old data without deleting it. Not only can the IOT analyse and guide the device to make effective decisions, but it can also track how a particular action is being performed. Security is obligatory for the maximum of the IoT utility that has already been deployed or can be deployed. So that, in the future, the

data & information will not get to the competitors. IOT applications are growing rapidly in most existing industries and software companies all over the world [11].

With so many benefits, it's not hard to understand why DevOps is the number one choice for many IT organizations. DevOps of IOT is inevitable. It requires commitment, collaboration, communication, and a willingness to change. However, it can be simplified with technology that integrates system development, testing and debugging, deployment, monitoring, and management into a single platform.

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