

PLUG AND PLAY APPROACH: SENSORS TO CLOUD COMMUNICATION

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Abstract - Ideally, connecting devices, machines and systems to the cloud should be as straightforward as interfacing USB devices or Peripheral Component Interconnect Express (PCIe) extension cards to a PC. Sensors are utilized in wide scope of uses in industry for checking, controlling and mechanization. Plug and play is a term used to depict the attributes of a device detail which encourages the revelation of an equipment segment in the system. Plug and Play approach is a characteristic objective in accomplishing a brought together system interface with programmed stacking of drivers of any part when it is associated with a network. The clouds guarantee to get the Big Data and advanced analytics whenever, anyplace. Internet of Things (IoT) gateway innovation locate an utilitarian way towards the Plug and Play vision. This paper presents a way to deal with utilizing all sensor information by means of a cloud association using Cloud API for IoT gateway by enabling actions like making the association, opening the cloud application, perceiving devices and configuring. Hence enabling the accesses of sensor data via cloud connection.

Key Words: Sensors, Plug and Play, IoT gateway, Cloud API

1. INTRODUCTION

Due to persistent development of industrial automation technologies, numerous modern industrial automation systems, which are fundamentally made of sensors, actuators and controllers, are presently moving to wireless world with the assistance of IoT innovation. In the realm of system inter-networks, it is hard to monitor the heterogeneous information gathered from Data Acquisition (DAQ) Devices of systems administration part manually as it is tedious and a dreary procedure.

Sensors are utilized in huge numbers in different industries. These sensors management over a network of systems is a responsible task while significant and dependable data is accumulated from them. With the end goal for sensors to coordinate effectively, they should epitomize networking abilities that give flow of information and control. There is a solid push in the industries to fit the principles that empower systems administration for obtaining data from sensors.

In actuality, since sensor information being assembled at the field level has numerous properties like size, protocol, structure, interface and transmission path, it has

been essentially difficult to realize a cloud association with different sensors with just a couple of clicks. Processing of heterogeneous information into significant data, is a barrier in understanding different sensor information due to the absence of local logic. However the intrigue of the clouds to get the Big Data and Advanced Analytics anyplace, anytime has motivated the designers to concentrate on gateway technology.

Today, advanced gateways, provides interaction of different IoT technologies between themselves and different IP or non-IP networks, permit to coordinate with the hardwares, devices and systems, which work on a different diverse modern conventions with one another. These gateway technologies help to create a practical way towards the Plug and Play vision.

This paper's main objective is to amplify the importance of IoT gateways and throw light on the evolving cloud API for IoT gateways which help in the Plug and Play approach for sending sensor data to the cloud. The rest of the paper is organized as follows: Section 2 gives information on Plug and Play vision; Section 3 gives brief description on cloud API; Section 4 introduces the IoT gateway concept used in sending sensor data to the cloud; In Section 5 the concept of cloud APIs for IoT gateways is emphasized; Section 6 concludes the paper.

2. PLUG AND PLAY VISION

Plug and Play vision is to emphasize on sensors-to-cloud communication and amplify the importance of gateways to show the Plug and Play capability.

Plug and Play, shortened as PnP, is an appealing expression used to portray devices that work with a PC framework when they are connected, show the details of a device and facilitates the revelation of an equipment in the system.

The user does not need to manually introduce drivers for the device or even tell the PC that another device has been included. Rather the PC naturally perceives the device, stacks new drivers for the equipment if necessary, and starts

to work with the recently associated device. Through the PnP approach, sensor nodes accomplish more prominent system adaptability and proficiency.

The PnP capability [1], [3] of the smart sensor data allows to inform the gateway immediately when a new server node joins the network and similarly notify when an already existing sensor node leaves the network. PnP competent needs to describe its quality to different nodes in the network and configure itself to the default settings amid a start-up to perform actuator capacities.

3. CLOUD API

An Application Program Interface (API) [6] is a set of schedules, conventions, and tools for implementing programming applications. Fundamentally, an API indicates how programming parts ought to connect. APIs particularly Web APIs for Internet programming, give a characteristic method to wrap and convey programming capacities as independent administrations. These can be accessed through standard conventions. By filling in as the agreements between service providers and users, APIs can adequately shield heterogeneity.

As cloud is a rising prototype of computing, it tosses open different difficulties and issues. API acts as the interface between cloud supplier and the client.

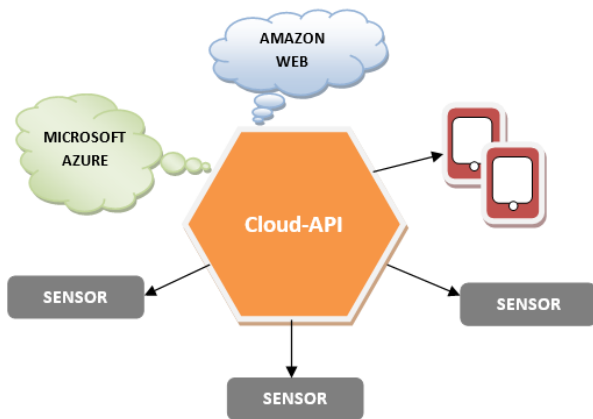


Fig -1: Cloud API

Cloud stages, like Amazon, Azure and Ali, give APIs to different administrations. As indicated by programmable Web report [7], there have been more than 15,000 APIs accessible these days, an impressive increment from around 200 APIs in 2005. As Cloud APIs are broadly utilized and persistently being developed on the web, Plug and Play approach for accessing heterogeneous sensor data from the cloud is evolving.

A Cloud Application Programming Interface (Cloud API) [2] is a kind of API that empowers the improvement of the services utilized for the stipulating of cloud hardware, software, and platforms. It is the centre segment behind any open cloud arrangement. A cloud API acts as an interface that gives immediate and backhanded cloud framework to the users. It communicates with a cloud

structure to designate storing, computing and networking resources for mentioned cloud applications.

4. IoT GATEWAYS

Gateways are mind boggling devices with great transcoding and decision-making capabilities. Gateways gather, break down and transcode sensor information and then decide if it goes to the field or to the cloud or maybe another gateway.

Internet of Things (IoT) are things with sensors that are programmed to send and get information periodically. Gateways gather information from numerous sensor hubs, send it to an end point server which might be nearby or in cloud. An IoT gateway gathers different sensor information, deciphers between sensor protocols, processes sensor information before sending it forward.

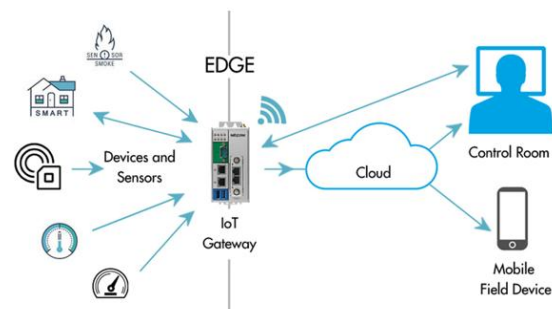


Fig -2: IoT Gateways

An IoT gateway [4], [5] connects the systems like IoT devices, sensors, hardwares and the clouds. Convention interpretation, information handling, stockpiling, device security, control field devices dependent on information collected by sensors are certain functions performed by IoT gateways. It supports numerous communication protocols and data types between the different sensors and also understand the information transferred between different sensors. On whole IoT gateway is what that sits between the devices and sensors to speak with the cloud

The recent IoT gateways additionally assume an undeniably significant job in giving edge analytics, and guarantee that the most significant data are sent to the cloud to be followed up on. Sensors are commonly connected to MCUs, which transmit data to portals; about each IoT system needs an approach to associate sensors to the cloud so information can be transmitted between them. IoT gateways can be fundamental in making this association conceivable, and numerous sensors will transmit information to the gateway, which will send that data to the cloud.

5. CLOUD API FOR IoT GATEWAYS

Generally, gateways are intended to incorporate explicit sensor data and transmitting information as straightforward data to the range of cloud interfaces. This is done by the new cloud API for IoT gateways. Cloud API for IoT gateway involves in giving an effective strategy to collect data from sensor nodes associated in various systems, process the information and send them to a local or cloud server. With the help of new cloud API, the IoT portal communicates locally with different sensors for handling and changing over the received sensor data.

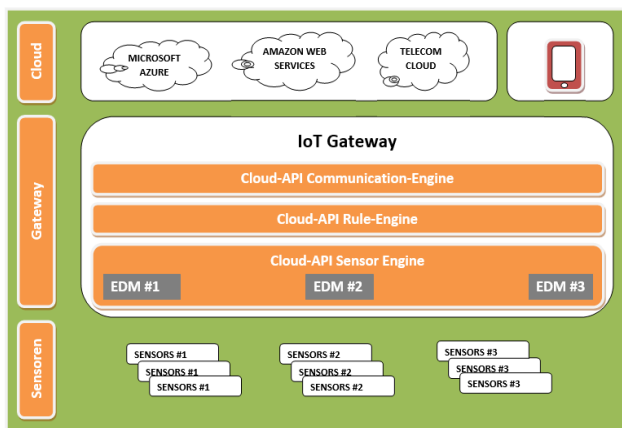


Fig -3: Cloud API for IoT Gateways

IoT gateways enabled by cloud API consists of three layers

- i. Cloud API sensor engine
- ii. Cloud API rule engine
- iii. Cloud API communication engine

i. Cloud API sensor engine

This layer consists of Embedded driver modules (EDMs). EDMs interface with equipment and external extension cards, makes an interpretation of received information into application specific IoT gateway logic. This sensor engine, with EDM modules consolidated in its structure, is among the primary programming segments to be made as a cloud module. Its basic function is in moving information from neighborhood sensors to a nonexclusive middleware.

ii. Cloud API rule engine

Information is transmitted into the cloud through predefined interfaces and procedures. By utilizing characterized modules and functional blocks, logic interfaces can be casted in every application. The EDM for the Electronic Application Programming Interface (EAPI) of PC on-modules empowers key execution data such as system temperatures and voltages, CPU use or theft

recognition to be effectively transmitted to any cloud by using the new Cloud API approach.

iii. Cloud API communication engine

In today's industries there is a requirement to build brilliant, effective techniques for accepting and preparing information locally, and afterwards sending it to the cloud.

To address this issue, cloud APIs must be application-prepared as well as principles based, so as to convey Plug and-Play for the wide scope of wired and wireless sensor networks. With this property of cloud API heterogeneous protocol arrangements can be coordinated with sensible and advanced resources, for example, Bluetooth LE, ZigBee, LoRa and different LPWANS, just as wired conventions for modern computerization. With institutionalization of a cloud API for IoT gateways, the portal's cloud interface works autonomously for the cloud supplier.

Communication engine helps in achieving the industrial need by enabling communication with servers or various clouds by means of wired or wireless associations in an encrypted manner. It is an open standard methodology to readily deploy sensors, gateways and clouds, independent of the information type, processing condition or end-use application.

6. CONCLUSIONS

The concept of IOT is in existence from quite a long time, however there is a need for specific implementation and genuine advancement of IoT. Plug and-Play approach should likewise reach out to the arrangement of IoT gateways. Because of the standardized cloud APIs for IoT gateways, there is no need to program or to develop any characteristics of a sensor.

In this paper it is seen that IOT along with the specialized qualities of the IOT application and standardized cloud API schematic, utilize the IOT gateway as a bridge to exchange information between sensors and clouds, thus enabling a Plug and Play approach for sensor to cloud communication.

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