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Cloud Communication and IoT for Smart Devices in Real Time Environment

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Abstract: ***Internet of Things (IoT) Based modernization and consolidation mode are a core for constructing positive and analytical network smart service. Progression of related innovations and scholarly alternatives include driven changes inside each industry. IoT Based Smart Services has two fundamental segments, one is accumulation framework and second one is administration framework. The collection system is a smart device (Smart Agent System) on the managed devices gathering the device and network information via various methods. This paper explores the possibility to apply IoT based smart device in cloud.***

Keywords: IoT, Smart Device, Cloud, framework, network, smart

I. INTRODUCTION

The Internet of Things (IoT) is the inter networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. The IoT enables items to be detected or controlled remotely crosswise over existing system foundation, making open doors for more straightforward incorporation of the physical world into PC based frameworks, resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. At the point when IoT is increased with sensors and actuators, the innovation turns into an occasion of the more broad class of digital physical frameworks, which additionally envelops advancements, for example, shrewd lattices, keen homes, insightful transportation and savvy urban communities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Typically, IoT is expected to offer advanced connectivity of devices, frameworks, and administrations that goes past machine-to-machine (M2M) interchanges and covers an assortment of conventions, spaces, and applications. The interconnection of these implanted gadgets (counting savvy objects), is relied upon to introduce robotization in almost all fields, while additionally empowering propelled applications like a keen matrix, and growing to regions, for example, shrewd urban areas. "Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with worked in sensors, DNA investigation gadgets for ecological/nourishment/pathogen observing or field activity gadgets that help firefighters in inquiry and save tasks.

II. COMMUNICATION SUPPORT OF IOT-BASED SMART SERVICE

A. Bluetooth

A Bluetooth device uses radio waves instead of wires or cables to connect to a phone or computer. A Bluetooth item, similar to a headset or watch, contains a little PC chip with a Bluetooth radio and programming that makes it simple to associate. When two Bluetooth devices want to talk to each other, they need to pair. Communication between Bluetooth devices happens over short-range, ad hoc networks known as piconets. A piconet is a system of gadgets associated utilizing Bluetooth innovation. When a network is established, one device takes the role of the master while all the other devices act as slaves.

Piconets are established dynamically and automatically as Bluetooth devices enter and leave radio proximity. With the advent of Bluetooth with low energy functionality (Bluetooth Smart or BLE), developers are now able to create small sensors that run off tiny coin cell batteries for months, and in some cases, years. Many of these Bluetooth sensors use so little energy that developers are starting to find ways to use scavenged energy, like solar and kinetic, to power them a potentially unlimited life from a power

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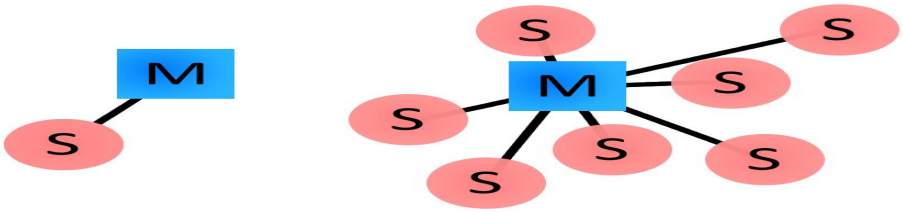
perspective. Bluetooth is a wireless technology standard for exchanging data over short distances (using short wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz from fixed what's more, cell phones, and building individual territory systems (PANs).

B. Communication and Connection

A master Basic Rate (BR) / Enhance Data Rate (EDR) Bluetooth device can communicate with a maximum of seven devices in a piconet (an ad-hoc computer network using Bluetooth technology), though not all devices reach this maximum. The devices can switch roles, by agreement, and the slave can become the master. The Bluetooth Core Specification provides for the connection of two or more piconets to form a scatternet, in which certain devices simultaneously play the master role in one piconet and the slave role in another. At any given time, information can be exchanged between the ace and one other gadget (with the exception of the little-utilized) communicate mode. The master chooses which slave device to address; typically, it switches rapidly from one device to another in a round-robin fashion.

Since it is the master that chooses which slave to address, whereas a slave is (in theory) supposed to listen in each receive slot, being a master is a lighter burden than being a slave Figure 2.1. Being a master of seven slaves is possible; being a slave of more than one master is possible. The specification is vague as to required behavior in scatter nets.



Figurer 2.1 Master and Slaves concept in Bluetooth

C. Protocol

Bluetooth is a bundle based convention with an ace slave structure. One ace may speak with up to seven slaves in a piconet. All devices share the master's clock. Packet exchange is based on the basic clock, defined by the master, which ticks at 312.5 µs intervals. Two clock ticks make up a space of 625 µs, and two openings make up an opening pair of 1250 µs. In the simple case of single slot packets the master transmits in even slots and receives in odd slots. The slave, on the other hand, gets in even spaces and transmits in odd openings. Packets may be 1, 3 or 5 slots long, but in all cases the master's transmission begins in even slots and the slave's in odd slots.

The protocol architecture of the bluetooth consists of following in a bluetooth protocol stack:

Core protocols consisting 5 layer protocol stack viz. radio, baseband, link manager protocol, logical link control and adaptation protocol, service discovery protocol.

Cable replacement protocol, RFCOMM

Telephony Control Protocols

Adopted protocols viz. PPP,TCP/UDP/IP,OBEX and WAE/WAP Core protocols

1) *Radio:* This protocol specification defines air interface, frequency bands, frequency hopping specifications, modulation technique used and transmit power classes.
2) *Baseband:* Addressing scheme, packet frame format, timing and power control algorithms required for establishing connection between bluetooth devices within piconet defined in this part of protocol specification.
3) *Link Manager protocol:* It is responsible to establish link between bluetooth devices and to maintain the link between them. This protocol also includes authentication and encyption specifications. Negotiation of packet sizes between devices can be taken care by this.
4) *Logical link control and adaptation protocol:* This L2CAP protocol adapts upper layer frame to baseband layer frame format and vice versa. L2CAP take care of both connection oriented and connectionless services.
5) *Service discovery protocol:* Service related queries including device information can be taken care at this protocol so that connection can be established between bluetooth devices.

D. WIFI

Wi-Fi is a term for certain types of wireless local area networks (WLAN) that use specifications in the 802.11 family for example, Wi-Fi Direct, a peer-to-peer specification that allows devices guaranteed for Wi-Fi Direct to trade information without a web

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association or a remote switch. A Wi-Fi network uses radio waves to wirelessly transmit information across a LAN, the reach of which can be extended by a Wi-Fi range extender. A PC uses a remote connector to interpret information transmitted by radio waves. These waves are different from those emitted by, for example, FM radios, for which frequency is measured in megahertz (MHz). Wi-Fi's signals are transmitted in frequencies of between 2.5 and 5 gigahertz (GHz). This signal is then transmitted from the adapter through a router, after which it is sent to the internet(figure-2.2).

Figure 2.2 WIFI Cloud

Wi-Fi is generally utilized as a part of organizations, offices, schools and homes as another option to a wired LAN. Numerous air terminals, lodgings and fast-food offices offer community to Wi-Fi systems. These locations are known as hotspots. Many charge a daily or hourly rate for access, but some are free. An interconnected area of hotspots and network access points is known as a hot zone.

III. IOT BASED NETWORK SERVICES

The first step to advanced analytics is to collect the right kind and quality of information. That requires an external collection system or smart agent on the devices to gather the information of device and network.

A. Simple Network Management Protocol

An example for how input of such data for IoT-based services can be collected is the Simple Network Management Protocol (SNMP), which is developed by the Internet Engineering Task Force (IETF) in the late 1980s for essential FACPS management. It proved to be a very popular de facto standard for network management. It has been used as a network management tool for the Cisco Smart Care Service. SNMP is the most basic method of gathering bandwidth and network usage data that allows for external monitoring of changing the state of some SNMP-based device port-by-port. SNMP has four versions. SNMPv3, Version 3 of SNMP, described in RFC 2271 through RFC 2275, is a full IETF standard. SNMP is comprised of two entities: (figure 3.1) SNMP-capable devices (Agent) and Network Management Stations (NMSs). The agent is a piece of software that runs on the network devices (like router, switch, or Unix server) for collecting information. They can track of various operational aspects of the device. For instance, they could, monitor the state of each of its interfaces: which ones are up, which ones are down, collect management information about its local environment, and store and retrieves management information. NMS on the other hand, is a managing server running some kind of software system that can handle management tasks for a network, like polling and receiving traps from agents in the network. It is also responsible for performing responsive actions based on the data received from an agent.Once agents notice that bad thing has happened, they will alarm the NMS by sending SNMP traps information, as Figure 1 shows. While agents still perform collection operation via SNMP get or multi-get, NMSs make response, perform real-time local analysis and take some action. They even can page customer to let them know that something has happened while at same time agent send a response to NMS. If it is applied manufacturing industry, it would bend the traditional linear value chain into a "feedback loop" through which the heartbeats of manufactured objects transferred back the center.

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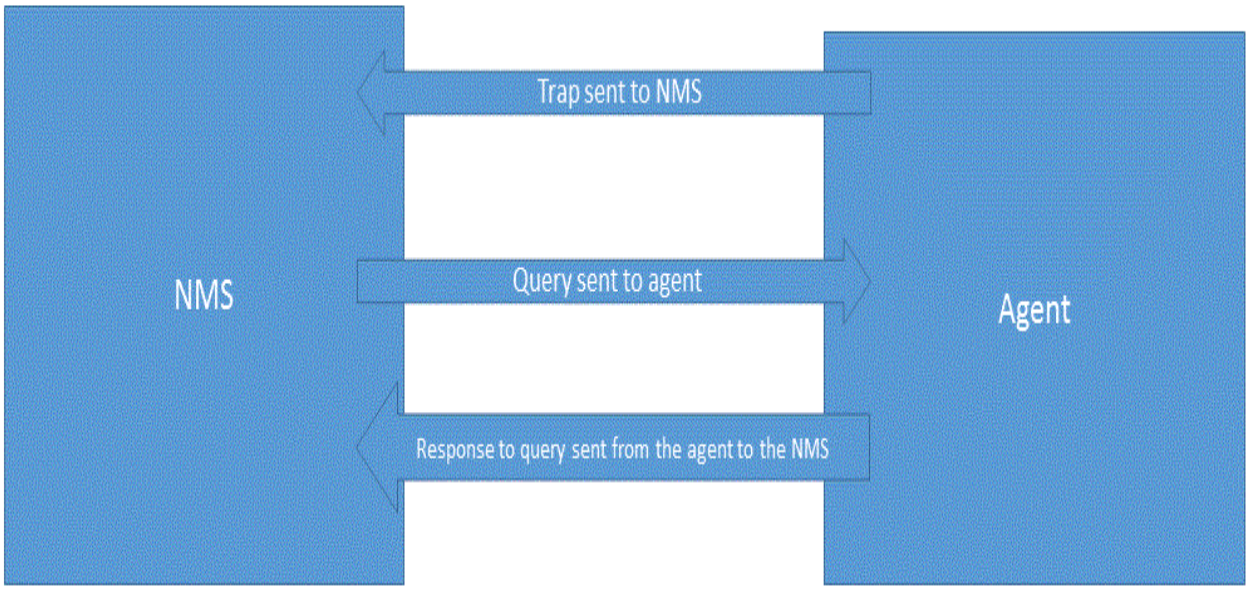

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Figure 3.1: Simple Network Management Protocol

B. Command Line Interface

In spite of what was originally intended, in recent years it becomes apparent that SNMP was not being used to configure network equipment, but was mainly being used for network monitoring, i.e. Performance Management and Fault. Because, in SNMP, When a NMS performs polling on network devices, for instance, to find out the central processing unit utilization, it would result wasting network bandwidth and missing the actual threshold on the polling interval. The alternative way to monitor configuration aspects of network devices such as configuration file, and inventory, is to use interface, by monitoring the number of broadcast packets received. A threshold of a variable on rising and falling it, data type, and interval would been set and hold as standard to make comparison. Once if the actual value exceeds or falls below it, notice will be sent. Besides, Command Line Interface (CLI) allows proactively monitor. It not only provides an alarm for the problem and but also initiates predefined automatic restoral processes that is possible to minimize downtime. Though most of devices will support CLI for configuration, SNMP normally could also be used for that if SNMP is well documented and support for a device. CLI is primarily for installation and setup commands, with additional configuration functionality.

C. NetFlow Protocol

A useful accounting management tool is NetFlow Protocol, which is a powerful tool used to capture IP Traffic for analysis. Though SNMP has already been a powerful tool to help people manage and troubleshoot their network, NetFlow has more impressive function on tracking CP/IP flows within the network. NetFlow as a necessary part for collecting IP traffic information in IoT network system enables the management center track the information package around the whole network from local IoT system to public internet. It also ensures that computing and network resources are used fairly by all groups or individuals who access them, by knowing who is using network service and for which purpose and accounting and charging back according to the resource utilizing level. The system could make proactively preparation, and reduce the computing load of network by then only send aggregated data. It also minimizes the possibility of error incident in network, and improves the performance of smart service.

IV. CONCLUSION

Internet of Things (IoT) Based modernization and consolidation mode are a core for constructing optimistic and analytical network smart service. A series of related technologies and intellectual options have driven transformations within every industry for updating data. The collection system is a smart device (Smart Agent System) on the managed devices gathering the device and network information via various methods. This paper explores the possibility to apply IoT based smart device in cloud.

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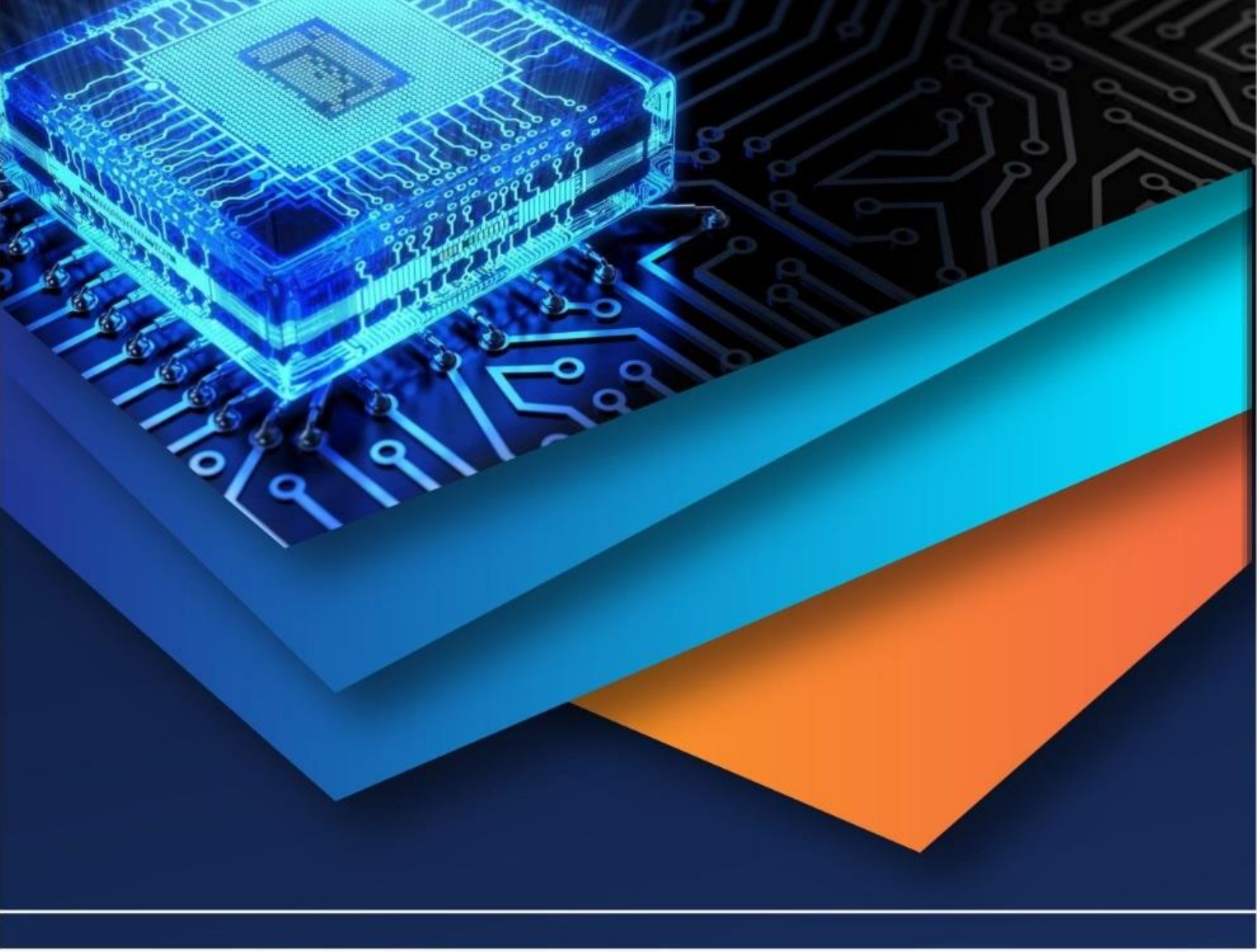

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