A SERVICE ORIENTED ARCHITECTURE FOR INTERNET OF THINGS (IOT)

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Abstract: Internet of things (IoT) is changing the way we identify information. It has motivated solutions for a number of everyday problems. With the advent of IoT, the internet will house several "intelligent "objects capable of making their own decisions. The basic architecture of IoT is characterized by the presence of three distinct layers, the sensing layer, the network layer and the application layer. The proposed paper aims at providing an efficient platform to develop solutions for the IoT. Service oriented architecture (SOA) has seen tremendous growth in the recent years. It has become one of the widely used platforms for development. In the proposed paper a SOA layer helps to manage the data and information. The heterogeneous nature of data in an IoT environment can be effectively handled with the help of a service framework.

Key words**:** Service oriented architecture (SOA), Internet of Things (IoT).

I. INTRODUCTION

The term Internet of things (IoT) was coined by Ashton in 1999. The success of IoT is largely due to the technological advancements in a number of fields. The innovations that directly contribute to this are wireless sensors, RFID and nanotechnology. For this ground breaking revolution to grow from ideas to actual real time applications, a lot of emphasis is on communication, computing and connectivity. The application opportunities are limited only by our imagination. We are inching towards an age of smart and intelligent things wherein the boundaries between fact and fiction are fast waning out.

II. RELATED WORK

2.1 LITRATURE SURVEY

Shancang Li, George Oikonomou, Theo Tryfonas, Thomas M. Chen, and Li Da Xu[1] proposed the need for decision making in an IoT environment. Existing method requires sufficient information to make decisions. The technological advancement has enabled the interconnection of diverse things. The diversity of things which can connect to the internet has grown rapidly, from a simple device to any physical object, virtually, anything can connect to the internet. This has primarily been possible through the advent of technologies like RFID tags, sensor networks, zigbee and so. The IoT boom has led to a drastic change in business processing and business models. One of the primary focuses of IoT is the communication and interaction among the various connected devices. IoT is characterized by the presence of 3 layers, i.e, sensing layer, network layer and application layer. The processing power of most wireless devices could be limited, hence in such a resource constrained environment there is a need for decision making.

One of the main focuses should be on establishing the scope of the implementation followed by creating the appropriate relational models and capturing the data and processing the information. A reference system model[2] has been proposed for implementing IoT over a manufacturing enterprise. Since most focus is on the underlying layer, there is a detailed classification of the data acquisition system. It can be classified on the basis of installation, communication, operation and so. Using an IoT based solution we can easily monitor, identify, and track objects. This reduces human intervention and provides agility and adaptability for real time challenges. Using IoT we can manage the next generation needs for modern manufacturing.

Qihui Wu, Guoru Ding, Yuhua Xu, et.al [3] have emphasized the need for a cognitive paradigm. The rapidly evolving field of IoT has seen several technological advancements. It has led to the development of objects which can hear, see and smell the physical world. This paper emphasis the need for a paradigm stronger than the existing one. It stresses on the need for objects that can understand, learn and think i.e. the need for "intelligent objects". This leads to the development of a cognitive internet of things (CIoT). This paper proposes a operation framework for the cognitive implementation of IoT. It aims at providing a comprehensive study on the fundamental cognitive tasks, namely, data analytics, perception and semantics based knowledge discovery, on demand service provisioning, and intelligent decision making. This feature bridges the gap between the physical world and the social world. For these groundbreaking ideas to take root there needs to be rapid technological advancement. Most of the focus is on computation, communication and connectivity. Cognitive IoT can be employed in various everyday applications ranging from smart homes to efficient traffic management systems thereby leading to a smart and intelligent lifestyle. It propels on the "cognitive" ability of the objects to sense and perceive. In a cognitive environment objects interact on the basis of context awareness with minimum human intervention. This paper proposes a stable framework for IoT with details on the cognitive ability in each layer of IoT architecture. The challenge lies in processing the mixed, heterogeneous nature of the data.

The traditional rank based search does not scale well for an IoT based solution. An ontology based sensor modeling[4] can be employed to enhance the performance of sensor search. The proposed search can be scaled to a middleware implementation upon further customization. A linked sensor middleware approach can be used. This aids in efficient capture of sensor data. This paper solves the issue of collecting and gathering sensor data. The data once gathered can be processed based on the implementing solution. A heuristic based solution is proposed to deal with data collection. This solution effectively catapults the advancement in sensor technology to serve IoT based everyday solutions.

III. DRAWBACKS OF EXIXTING SYSTEM

The major drawbacks of the existing system include the inability to provide users with services for sensing information of interest. There is no well-defined process to detect, classify and compose services. There is also no scope defined for co-operation among services to co-ordinate and complete complex tasks.

IV. PROPOSED SYSTEM

The underlying sensing layer is characterized by the presence of several wireless devices. Different wireless devices use different communication protocols. This leads to heterogeneous information processing. To address this issue of processing information from multiple resources, a service oriented architecture is proposed. A service provisioning framework is proposed over the network layer. This layer focuses on the representation, discovery and the composition of services. Using a service framework enhances the re-usability of the services being created. The services are clustered into individual groups. When information availability is either insufficient or overloaded at the various IoT edge nodes, an efficient decision making approach is required for efficient and dependable means of combining information. The service composition coupled with decision making ability aids in selection of suitable services based on the application layer requirements. Thus a SOA framework provides an effective means for solution over the IoT.

V. SYSTEM ARCHITECTURE

The system architecture provides a detailed outline about the layout of a service oriented IoT [Fig 5.1]. The architecture is characterized by 3 well defined layers. The underlying layer is the sensing layer. It helps to gather information from the various sensor devices. The network layer aids in processing information from the sensing layer. The SOA layer is built on top of the network layer. It is used to handle heterogeneous data from the sensor layer. The application layer serves to a specific user request utilizing the information from the underlying layers.

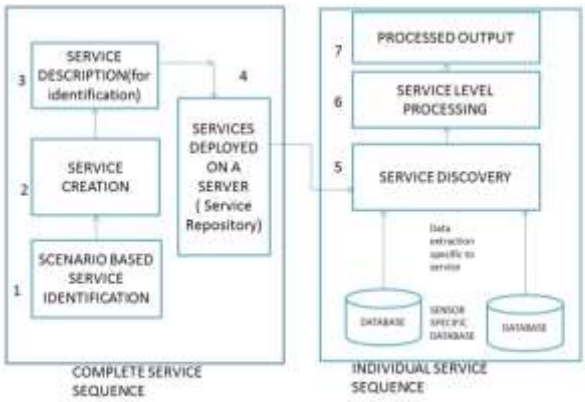

Fig 5.1 Overall service framework

A. SERVICE ORIENTED ARCHITECTURE

The service oriented architecture is a widely used design pattern. It effectively combines individual units of software to provide higher level of functionality. The communication involves either simple data passing or it could involve two or more services coordinating some activity. If a service-oriented architecture is to be effective, we need a clear understanding of the term service. A service is a function that is well-defined, self-contained, and does not depend on the context or state of other services. SOA provides a strategic capability for integrating business processes, data, and organizational knowledge. SOA is governed by a well-defined set of framework. The SOA architecture can be viewed as 5 horizontal layers and 4 vertical layers. Service composition and service discovery are the two major elements of SOA. Service discovery aims at discovering the appropriate and right service to serve a particular request from the higher layers in the applications. The service discovery is primarily guided by a WSDL. A WSDL expands into web service description language which acts as a "Descriptor" of a web service.

B. WEB SERVICES FRAMEWORK

The heterogeneous nature of the base layer can be well masked with the help of reusable service components. This leads to a new paradigm called "sensing as a service". This model could be built on top of the IoT infrastructure. This would provide a platform for collecting data from underlying sensor layer. This is enabled through an efficient middleware implementation. This paradigm shift towards the Web of things (WoT) could contribute largely towards SOA based IoT.

C. DATA PROCESSING USING SOA

The interaction and operation of different wireless devices are classified into different service components. Using a SOA based middleware solution there is enhanced flexibility. This leads to efficient processing of data and information. A service composition for IoT is proposed by minimizing the multi-parameter dependent matching value. One of the key goals of the service should be the ability for users to sense appropriate information and cooperation among the services. Since the current architecture lacks a standard framework for

information exchange, a service oriented architecture aids in channelizing the information gathered and processing them in an efficient manner. The reasons for using SOA could be many could be summarized as follows:

1. Applications can directly integrate with existing business and continue using the same interface.

2. There is no need for customized interface or translators for specific applications.

The key factors to be analyzed while doing data processing using SOA is how the web services map to smart objects and how effectively it can be implemented on the smart community.

VI. CONCLUSION

Internet of things is much closer to being a reality today than it has ever been. The merging of IoT and SOA could pave way for a much efficient and effective framework for implementing IoT based solution. This could serve as a platform for deploying several reusable services which efficiently masks the heterogeneous complexity of the underlying layer.

VII. FUTURE ENHANCEMENT

The service oriented IoT can further be implemented using cluster controlled decision making. The highly dynamic nature of IoT requires efficient decision making. This can be achieved efficiently using clusters. The services can be grouped into appropriate clusters which aid in quicker decision results. This could further improve the responsiveness of the services.

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