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A Novel Integration Architectureof Sensor Based Applications With Cloud For Internet Of Things

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ABSTRACT

Internet of Things(IOT), ubiquitous and pervasive Computing are platforms to modernize the existed version of many smart things.IOT with edge sensor nodes connectivity is an emerging solution to build/construct smart sensor based applications like Homes, Hotels, Healthcare, Automobiles and so on.in the current decade Wireless sensor application with IOT technology offers many low power things improve the Quality of Human life, effective Utilization of environment, resources and user's digital experience. Implementation of prototype is one side and incorporate in large scale applications are another thing. Building large scale sensor based smart applications require scalability, which one of the challenging issues in IOT to handle a large number of sensor along with deployed devices. Platforms/Middleware's eco-system allows to build more scalable IOT solutions. In this paper we analyzed the existed platform called CEB (Cloud, Edge, Beneath) architecture and its silent features. We also investigated the possibilities of Platform cache usage into the middleware's to increase IOT applications performance.

Keywords:- CEB, IOT

I. INTRODUCTION

IOT with sensor networks is an emerging solution to build/construct smart sensor based applications like Homes, Hotels, Healthcare, Automobiles and so on.in the current decade Wireless sensor application with IOT technology offers many low power things improve the Quality of Human life, effective Utilization of environment, resources and user's digital experience [1][2].Many researchers worked on WSN applications and protocols [3]- [5]. Sensor based smart cities and spaces sensor data and services will be computed and migrated to cloud which anticipate to provide optimized service cost. The migration of sensor data to cloud is not so easy which should require Cloud based RESTful web services model. Integrating and development of huge sensor nodes to cloud is the key challenging issue. Cloud sensor systems are the application specific, which requires different integration strategies for different applications. The present work address these issues to illustrate the Cloud-sensor architecture and Event based programming model.

To build large scale heterogeneous wireless sensors Networks, SAAS integration with WSN must fulfil two basic requirements. At first the Activate Cloud sensor Eco System developmentmust satisfy device integration with application development is one hand and Programmatic federated application implementation paradigm on another hand. [6] stated that based on the several different reasons and conditions, smart sensor application should not be designed and connected different environments. Every cloud-sensor integration system must fulfill two basic requirements,1. Application development ecosystem which handle majorly two activities, one is bifurcate device integration from the application development process and other is programmability effort.2. Scalable, reliable and energy-efficiency (Rapid growth of the sensors or devices or applications in the environment must work with minimize energy to achieve greater reliability).In large scale cloud sensor applications millions of heterogeneous sensor devices are connected for multiple applications which exchange large amount of physically sensed data causes high cloud traffic. The proposed cloud sensor eco system should manage the scalability metric along with less energy deplete of sensor nodes. Managing a large no of nodes not only an issue, data reliability between the sensor to the cloud is another. in Section II describes the related work towards the problem statement, CEB architecture (i.e., illustrated in the following Fig.1.) with event based programming approach, An Optimized bi-directional waterfall framework is discussed in Section III. Section IV illustrates the conclusion summary, possibilities and future directions of the research.

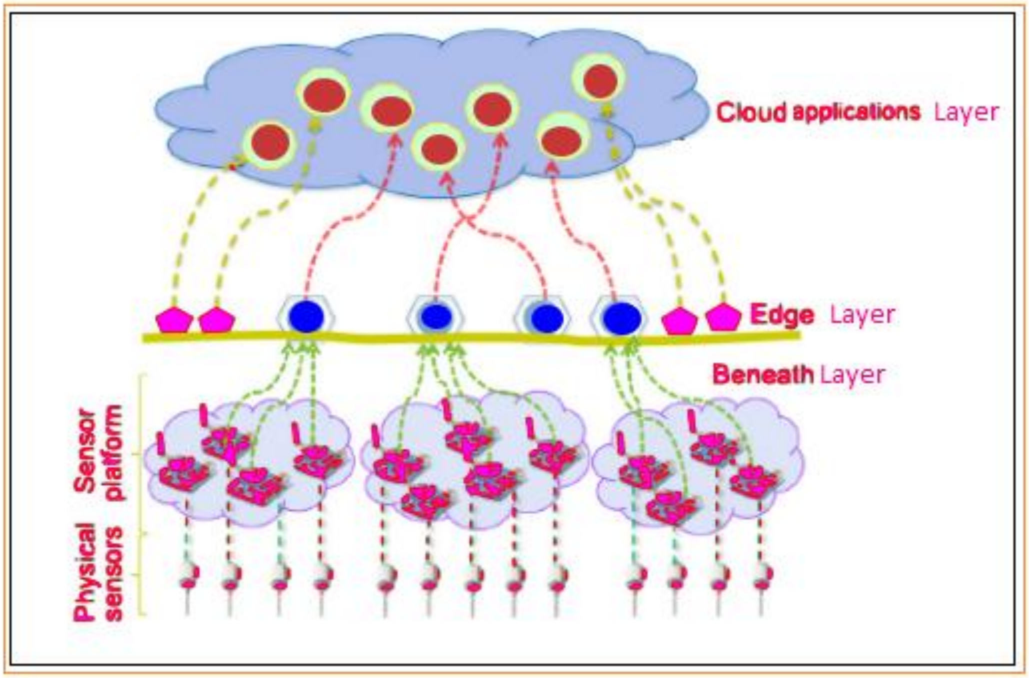

Fig1. 4-Tiered CEB Model

II. RELATED WORK

To enable cloud –sensor applications with 2-tier approaches [7][8] have impacted a lot of scalability issues due to dependability of the sensor Load (no of applications, sensors). AnOptimized 2-tier architecture model into 3-tier(CEB) increases the energy utilization, scalability of the system.CEB architecture illustrated in the fig.2.

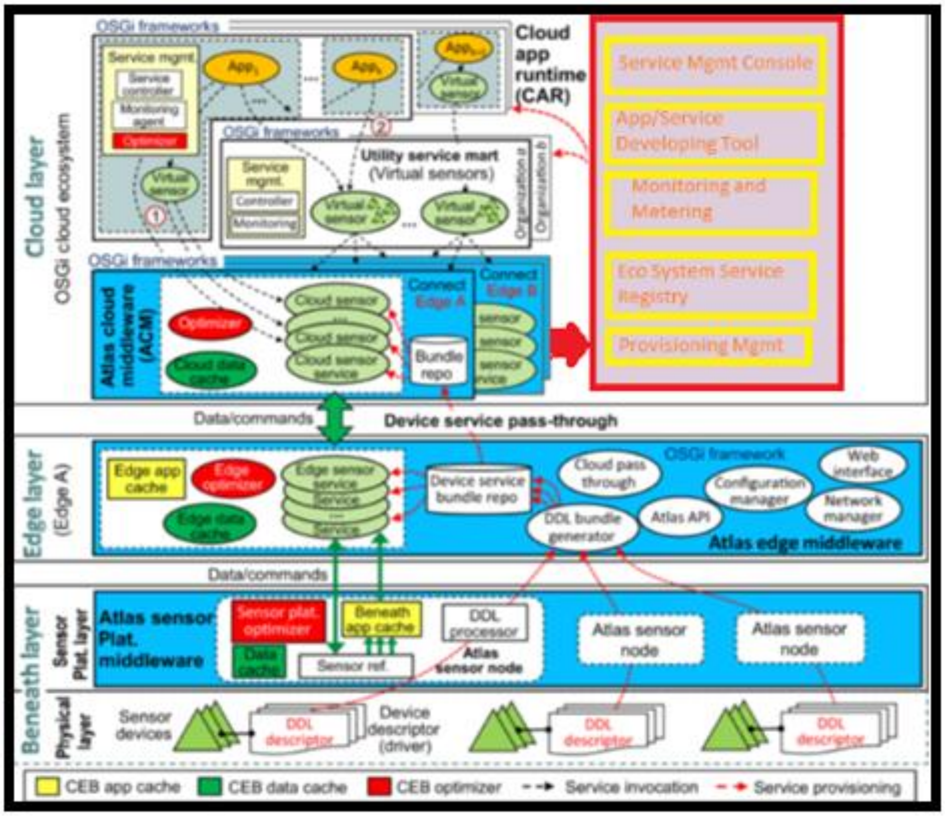

Fig2.CEB Architectural Overview

In order to improve energy efficiency, cache technology [9] [10] used widely for sensor based applications. Novel cache scheme [11] use query graph contains semantic of the application push down into the network layer in order to avoid redundant transmissions. [12] discussed aboutanbi-directional waterfall optimization framework (sensor readings, fragments of Application), cache scheme to improve scalability, energy efficiency of the CEB which works under the dynamic environments not like under static done by Query shipping [13] technique widely used by many researchers.

Overview of CEB

Atlas CEB (Cloud Edge Beneath) constructed based on SODA (Service Driven Oriented Architecture) and works on Atlas Architecture allows the end user to “Connect once and Load anywhere “[14].Bottom layer(Beneath) consists of two sub layers namely physical, sensor platform layers. Physical layer consists the sensor and its metadata where sensor platform layer have communication platforms or low power devices. [15] Device Description Language (DDL) are defined by XML (Extensible markup Language) address the discovery of the node as well service registration, illustrated in

Fig3.

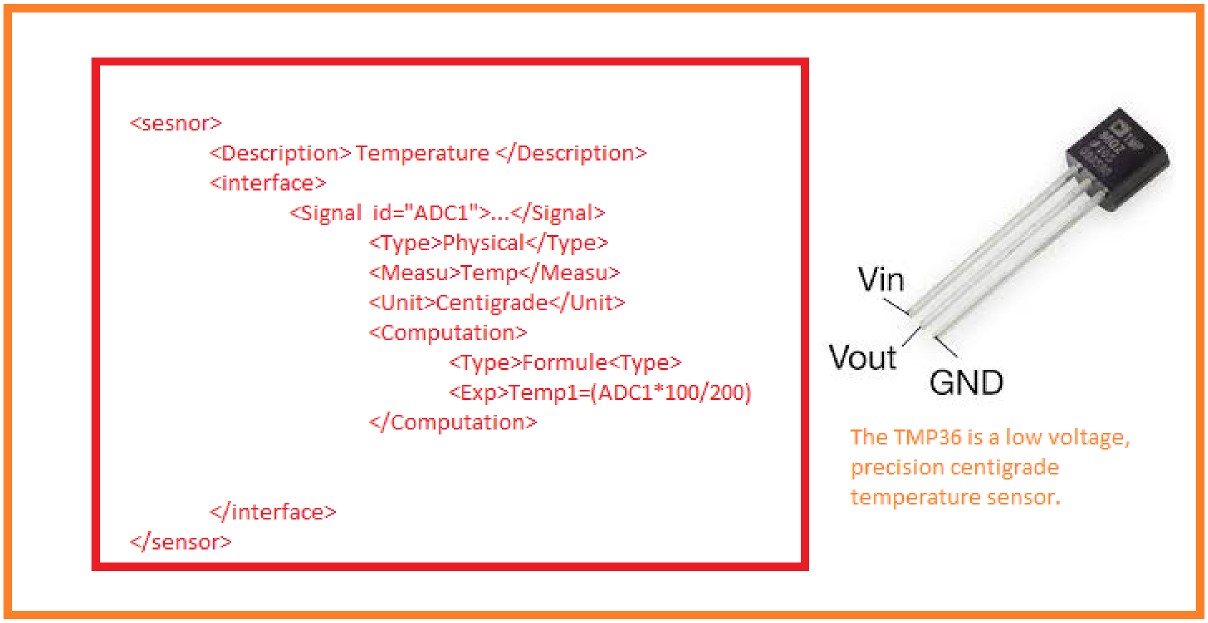

Fig.3.DDL for ADC1 Temperature Sensor

Edge layer typical be an either standalone application server or any other computing device which computes the group of sensor nodes operations. The clustering of the huge sensor nodes is depending on the type of application, example: habitat monitoring, Battlefield survival lance, HealthCare, Wild animal monitoring and so on. Finally, a Top level layer (Cloud) handles the application development/deployment and execution. The cloud layer well-structured and connected with multiple edge server which handle scalability of the sensors located at beneath layer. CEB build on the top of Atlas [16] which is in development of SODA [17]. The sensor Node initialization, configuration, control, data cache and acquisition handle with Atlas middleware. Basically every Atlas node have three layers (Device, Processing, Communication). [18] [19] OSGi (Open Source Gateway initiative) is used to handle configuration management and service discovery which is a part of Atlas middleware.To handle Dynamic environments CEB adopts the Amazon web services at Cloud layer level.

Overview of E-SODA

E-SODA is anevent based programming model, all the sensor in the beneath layer resolves physical data which is abstracted into an "events" handles the event service of the Cloud enterprise application. application benchmark design and development for large scale cloud applications, the triggering event and data flow must satisfy the things (Size of the sensors, the range of Sensor data (characteristics, tolerance, Degree of time) Size and range of events (environment, Human activity, and so on))

ECA (Event, Condition, Action) Rules

Whenever the Physical event occurred in the sensor network, Condition are evaluated based on the event and if the condition is a valid the it perform the appropriate action. Generally, the behavior of the network will have extracted from these three steps. Each item in the ECA have various unique roles. The rule triggering decides the event, when an event performed what should have done defined by condition and finally response of the event will get from specified action [20].

CEB Optimization framework

[21] The plain model more extended with Cache management at the application layer level, which reduce the data processing cost and

workload of the multiple layers. This optimization model works with both directions from edge layer to application layer and vice-versa. In this optimization framework author proposed four different algorithms hosted at different layers of the environment, namely AFCA-1,2, AAAS and BPA.

Application fragment Caching Algorithm-I (AFCA-1) perform caching downwards from top layer to lower layer (edge layer) impacts the bandwidth reduction,memory usage,processing,etc. improves the cloud scalability. PA is used for shortcut evaluation at edge layer skipped sensor sampling and sub-section of sensor sampling evaluation increases the energy efficiency.

AAAS ("Application-Aware Adaptive Sampling Algorithm") mainly works at beneath layer in order to achieve reliable data aggregation at sensor level and triggering event at application level. AFCA-2 algorithm outcomes the energy efficiency and best performs at beneath layer.

III. CONCLUSION

In this paper, we analyzed Cloud Edge Beneath (CEB) architecture along with optimized framework. CEB adopts an event based application programming model andoptimized with bi-directional data/application waterfall model perform caching from edge layer to cloud layer and vice versa. This Optimal framework is suitable to build large scale IOT applications. Current study carried out CEB importance and its optimization framework with cache concept. We investigated the possibilities of applying Platform level cache in terms of a variable, cache partition at PAAS level to improve CEB performance more. As investigated some more light weight REST API requires to increase the scalability, energy efficiency of the cloud dominant resources.In future we will enhance the performance of the framework in terms Platform cache possibilities and challenges in various layers to achieve more optimization.

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