Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 11, November - 2017

Smart Building with Big Data

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***Abstract* - In future the advanced Building Management Systems will be connected to variety of efficient networks, sensors and soon. The objective of this is to make the environment in more comfort way of utilizing the network. This paper describes based on the Big Data technology, how the system is dedicated for the effective use of sensors for data processing and storage which increases the potentials in terms of application development and data analytics. We advocates in this paper about how the smart building meets scalability, flexibility, data processing, privacy, interoperability, etc., This paper also explains supports from the system to the end user in current affairs and also in future.**

Keywords: Big Data; Building Management System; Smart Building; Big Building Data;

I. INTRODUCTION

Considering the building sector, there will be more and more challenges due to climatic change because of sustainable and dynamic energy management systems. To improve the performance and reliability of the networks in a building, concept of Smart Building arises. Smart control system is used to employ Smart Building, which are analyzed with the goal as to use minimized energy and provide a more comfort zone of use. Smart controls in the sense, it deals with various resources such as ventilation, lighting effects, lightning, equipment used, temperature of apparatus, etc., For this, large amount of data must be gathered with the networks, sensors and the actuators.

Next consider on challenges in the data handling in Smart Building. First, due to technology and diversity, domain has a large amount of data related to history with interoperability problems. Second, controlling and measuring the sensing frequency of the sensors leads to processing large amount of data. Third, for monitoring, post occupancy evaluation and advanced control leads to use more and more complex models with both historical data and real time data. While many frameworks which work to analyze the needs of time aggregation and real time processing has attained an attention, which was not mature in current affairs. There are some approaches which supports the data collection from the sensors to their exploitation.

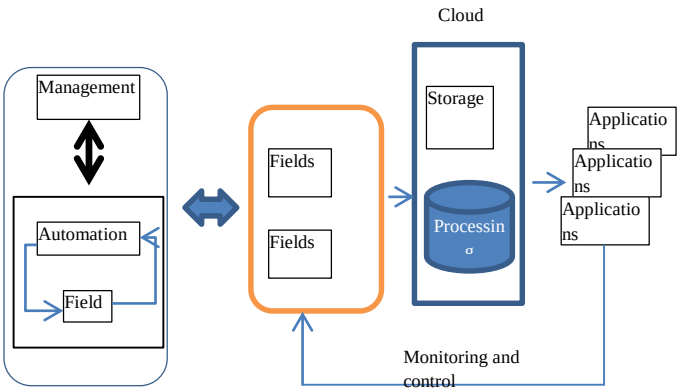
Big Building Data (BB Data) is sharing and processing system which ingests and measures the Big Data expectation for Smart Building environments. In section 2, explains the overview of BBData, Big Data technologies for Smart Building and their effects, architecture of BBData, challenges of big data and BBData's Features and the benefits of professionally building the Smart building.

II. SYSTEM DESCRIPTION

A. From BMS to Web of Building

In this section, for the processing and storage of sensors data, there is a need for a dedicated system. Importantly, the architecture is based on Big Data technologies and also it is remote. It enables new qualities in terms of application development and data analytics and also extends from one smart building to more and more like smart area and smart cities which emerges BMS with Big Data called *Web of Buildings.*

Figure 1. Bms To Web of Buildings



B. BBDATA ARCHITECTURE

In this architecture, the inputs are taken from different kinds of sensors. BBData uses *virtual object*, for the compatibility of inputs. This virtual object has Meta data, which is handled by collectors. These collectors create *BBData* for each input. In some case it generates timestamp. Then the data is validated and authenticated using object's ID and assigns a secure token, which is in queue. Then the data is assigned in queue, then processed and then result is stored in another message queue. Each of the processing tasks is handled by separate processors, which is running in Hadoop cluster. In this design, it is possible to add or remove processors without affecting the system. There are two types of processors. First, saves the input records in storage and second, computes the records and saves the result. Applications and the users can access the data using *API.*

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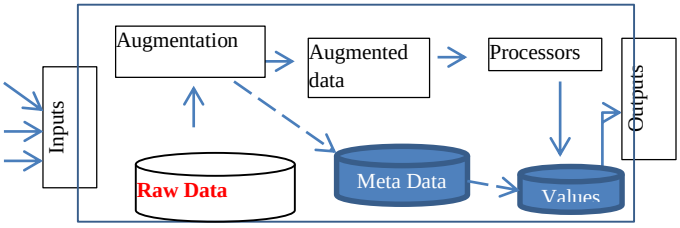
Figure 2. Architecture of Bbdata



III. BIG DATA

It is data sets that are so large or complex that traditional data processing application software is inadequate to deal with them. The challenges of Big Data includes data storage , search, capturing data, querying, data analysis, sharing, transfer, visualization and updating and information privacy. Data sets grow rapidly because they are gathering more information by cheap and rapid. The world's technological per-capita capacity to store information has roughly doubled every 40 months since the 1980s.

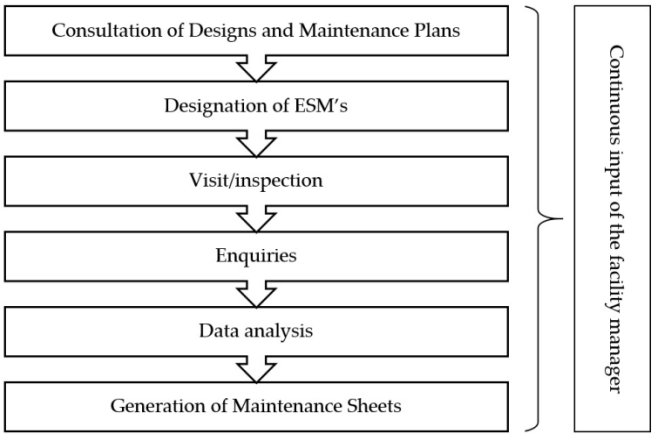
CAP theorem is used at the storage level, means consistency, availability and partition tolerance. The given input is shared among the processors according to a strategy defined by user. In BBData, Input records are distributed based on the object ID and timestamp, which enable equal load to processors. Data are measured periodically and stored in different machines.

In processing level, energy management and building data is focused to compute time based aggregations. While aggregating the main data-processing frameworks like Apache is used to satisfy general solutions.

IV. USER SERVICES

BBData offers many tools depend on the type of tasks like building user, building owner, architects and consultancies. The important tool in this is for data monitoring and plays an important role. In this service real added would be added depend on the behavior of the occupants. Figure 3 illustrates the method for building maintenance. For the architects, the tool uses the information to build the guides and use it for future constructions. Building owners have interest in three types of services. The first one is anomaly detection. Second one is building renovation and at last third one is building performance. Based on the current model and the historical data, prediction model is generated.

Figure 3. Post Occupancy Evaluation Based on Method for Building Maintenance



V. CONCLUSION AND FUTURE WORKS

In this paper, based on Big Data technologies, produces new qualities for analyzing the data and application development also extends from one smart building to more and more like smart area and smart cities. Based on BBData , for storage and processing a distributed system is used. Finally we explained the various services offered by BBData that are dedicated to various users.

In future work, develop a services for automatic anomaly prediction and detection services.

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