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## A Novel Method to Effectively Manage Rack Space Units in Datacenter

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**Title:** A Novel Method to Effectively Manage Rack Space Units in Datacenter

**Abstract:** In a typical datacenter several new servers, switches, network and storage devices are ordered and kept in a docking area for a long time before hosting them into rack space units by system administrators or asset management teams.

It is a cumbersome task to refer documents or manually determine and assign free rack space units to host new devices. Currently, there are no effective solutions to instantly identify free Rack space units and assign free Rack units as soon as devices arrived in docking area of the datacenter.

The proposed invention helps identify all the free Rack units in each rack of the datacenter using Ultrasound sensor modules fitted to each racks and effectively manage the rack space unit.

### **Prior Solutions:**

#### **Manual tracking:**

System administrators or asset team personnel visit the datacenter spread across several floors in a region. System administrators or the asset team personnel access the racks and document the free space in each Racks in terms of Rack units.

This task must be performed periodically to effectively maintain the datacenters.

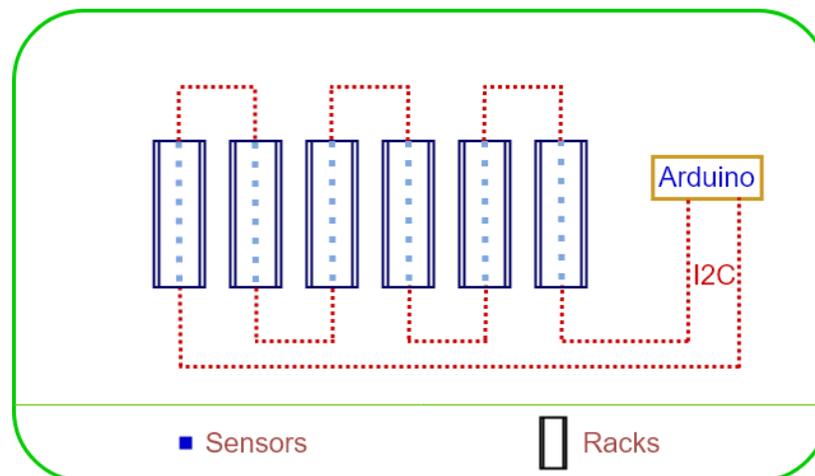
The process involved is laborious, time consuming, and often prone to human errors, which increases the cost of any R&D organization.

**HPE Intelligent Power Distribution Unit:** HPE Intelligent Power Distribution Unit provides utility that identifies servers and devices in a rack by monitoring the power consumption. HPE Intelligent Power Distribution Unit solution does not identify Free Rack unit space in each rack instantaneously.

## **Description:**

This paper describes an innovative way to find the free rack space unit in each rack hosted in datacenter by using ultrasound sensors. There will be an ultrasound sensor bar module kit which is used to hold the sensors. The bar module can be attached to rear of the rack.

Fig 1 shows sensors and rack arrangements in datacenter. Ultrasound sensors are independent of environment, noise, light, temperature, steam, fog, dust and humidity. Hence, using ultrasound sensors are beneficial for rack unit reservation portal management system.

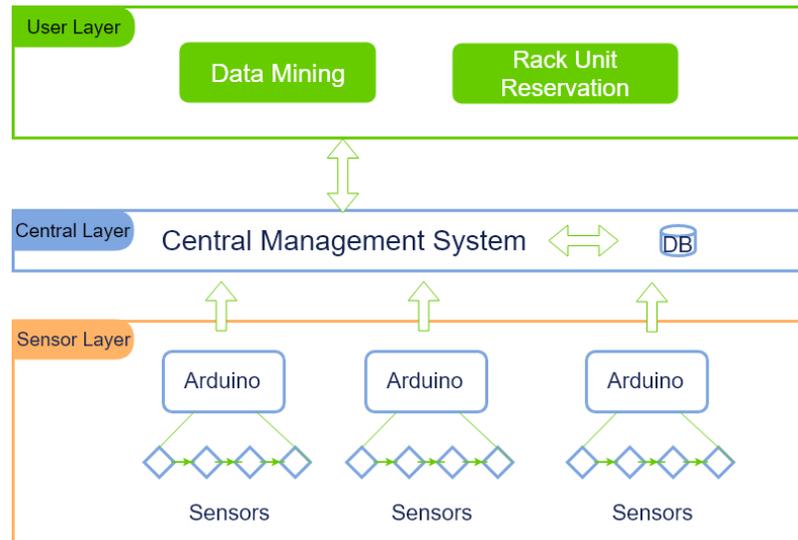


**Fig 1. Sensors and Rack arrangements in datacenter**

Ultrasonic sensors have two key components the transmitter module and the receiving module. The distance of the object from the Ultrasonic sensor is directly proportional to the time taken by pulse travelling back and forth. By using this principle, we can verify whether the object is present or not at a particular distance. Ultrasonic sensors are placed in each Rack unit of all racks in datacenter. Ultrasonic sensors belongs to a particular Rack (42 in 42U rack) are connected to Arduino board serially through I/O expansion shield via I2C protocol.

Arduino keeps track of the sensors' data (time and distance of ultrasonic pulse) separately since, each sensor have a Unique Identifier. And also generation of ultrasonic pulse can be controlled by Arduino board. The

ultrasonic pulse is generated periodically in serial manner. The pulse frequency can be customized based on the requirements to validate whether rack unit is available or not. Arduino will mine the sensors' data and push to the database through Central Management System periodically.



**Fig 2. Solution Architecture**

Central Management System contains 2 or more servers in a cluster. Central Management System has following components.

1. Admin Portal – All racks, rack units, Arduino and sensors will be presented to admin in visual format.
2. Manage and monitor Arduino board and corresponding sensors per rack.
3. Managing the Database.
4. Provide RESTFUL web service(create, read, update, and delete operations)

Applications:

The key features of rack space unit management solution are:

1. Rack Space Unit Reservation: The Rack space units can be reserved through online portal powered by REST API.
2. Reporting: The report of rack unit usage data can be monitored and can be optimized.

3. Error Analysis: The report can also be used for identification of unusual data records.

#### Handling of Fault Tolerance:

1. Sensors: All sensors connected to the Arduino board can be validated periodically for proper functioning. The faulty sensors will be highlighted in the admin portal.
2. Arduino: Central Management System will immediately notify the Administrator with the corresponding details of the Arduino board.
3. Central Management System: The servers in Central Management System will be clustered with Master/Slave combination. If one fails, the other will take over and services will be online.

#### **Advantages:**

1. The Rack unit data is real time and System Administrators/Asset team or the management can leverage the data for capacity planning.
2. Datacenter team can reserve the rack units using Rack unit reservation tool before procuring any new servers, storage and network devices.
3. Solution is cost effective, easy to implement, and enhances datacenter operational efficiency.

#### Disclosed by:

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