

# *Data Center Monitoring System Upgrade*

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**Abstract** — *The project was developed at the Headquarters of the Defense Commissary Agency (DeCA), located at Fort Lee, Virginia, that operates nearly 240 commissaries worldwide. The Agency's data center was experiencing a high number of unscheduled service interruptions. After observing these incidents and the current data center environmental monitor system configuration, the project was able to identify several areas that needed to be improved. Changes in the incident response structure helped reduce response time. Data center layout reconfiguration helped maximize the current environmental monitor system. The project was successful in reducing unscheduled service interruptions by evaluating the current incident response process, changing the server layout configuration and optimizing the sensor placement within the data center.*

**Key Terms:** *Environmental Monitor System, Process Flow, Data Center, Incident Response.*

## **INTRODUCTION**

When a data center grows without the proper planning, it eventually causes problems with its environmental monitor system. The main theme of this project is to provide a stable data center environment where the commissary can serve its patrons. The project took place at the Headquarters of the Defense Commissary Agency (DeCA), located at Fort Lee, Virginia, an agency of the United States Department of Defense (DoD) that operates nearly 240 commissaries worldwide. American military commissaries sell groceries and household goods to active-duty and retired members of all seven uniformed services of the United States.

Several years ago, the DoD had the agency consolidate three data centers into the agency's headquarters. The different Information Technology (IT) Directorates were successful in consolidating multiple servers within the same facility but neglected to upgrade its environmental monitor system for the new demand. This project helped respond to a problem the data center was experiencing in where there had been several service interruptions caused by temperature in the data center reaching critical levels.

There is a direct relation between a data center's environment and its performance. Adequately assigning the correct agency department to manage the data center's environment is instrumental. Upgrading the current environmental monitor system and processes was conducive to a well-managed data center. Since high temperatures, humidity and water are the greatest enemies of a data center the objective was to improve the data center's configuration and environmental monitor system by:

- Reducing the temperature below 82 degrees Fahrenheit.
- Improving technicians' response time to data center incidents.
- Improving the data center layout configuration.

To validate the project results, environmental monitor system data was taken before and after proper placement of the sensors and the data center layout was optimized.

## **LITERATURE REVIEW**

Well planned data center consolidation brings challenges. These challenges are magnified when the facilities are not prepared adequately to manage the growth. The lack of a proper project

deployment plan and inadequate internal controls can adversely affect the performance of a data center once consolidated. One of the key elements is understanding the impact environmental factors have on data centers. The understanding of these factors will help improve the data center performance and reduce unscheduled service interruptions:

- Key elements that need to be considered when consolidating data centers. There are many elements that are considered when consolidating a data center like climate control, backup generators, security, virtual environments equipment inventory and network requirements [1].
- The need of environmental monitoring system to monitor temperature. It is essential to monitor the temperature in the data center with the option of sending an alert notification [2]. It is also important to capture environmental monitoring data to improve energy efficiency and optimize data center performance [3].
- Sensor technologies that are available to capture environmental monitoring data. There are different types of open source hardware wireless sensor networks that are used to capture environmental monitoring data to improve energy efficiency and optimize data center performance [4].
- Environmental elements effect on the lifespan of IT equipment. Heat dissipation and hot air generation from racks in data centers have significant adverse effect on energy consumption of the cooling system and IT equipment lifespan [5].

### ANALYSIS AND IMPROVEMENTS

To document the current state of the data center, environmental monitor system data was captured to demonstrate how adequate temperature riding improves with proper placement of sensors. The data gathered helped identify data center gaps of the old system.

It was clear that sensor placement alone would not achieve the desired objectives and that a change in layout was needed. The project captured the old data center configuration and improved the configuration to maximize the environmental monitor system effectiveness. Additional efforts were done to analyze the old incident reporting and improve its process flow by aligning the process under the appropriate agency directorates.

### Proper Placement of sensors

The original environmental monitor system only had one sensor placed at the location of the servers before the agency consolidated data centers, as shown in Figure 1. In addition, the servers located near the sensor are old and scheduled to be sunset.

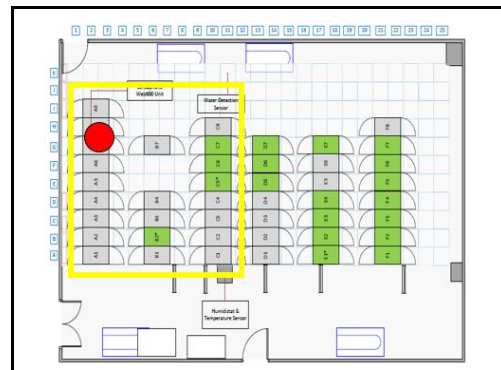
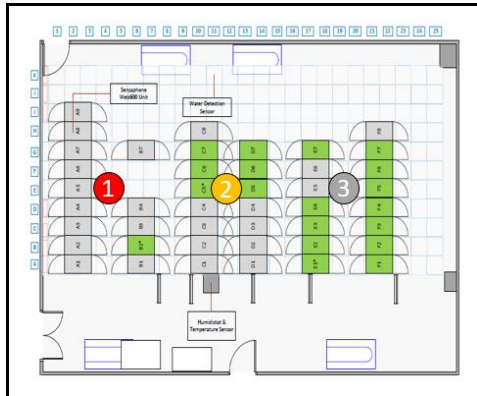


Figure 1  
Original environmental monitor system sensors

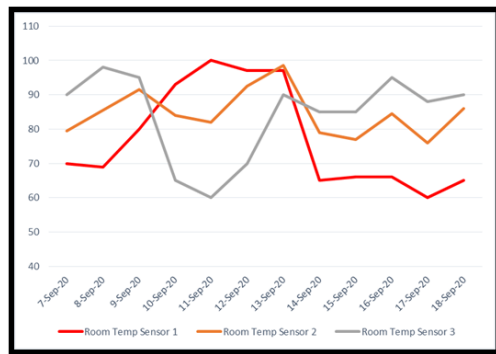
The placement of additional Sousaphone WEB600 sensors in the data center was done as shown in Figure 2. These additional sensors were instrumental in demonstrating to stakeholders the need of having an adequate environmental monitor system. Figure 2 provides a before and after visual representation of placement of sensors in the data center.

The placement of additional sensors helped compare data from all three sensors and provide a clear picture of gaps caused by rack sensor placement. This gap was identified in a graphic presented in Figure 3. This gap in temperature readings was preventing the timely response and

delaying the resolution to critical incidents affecting the data center.



**Figure 2**  
Placement of additional sensors



**Figure 3**  
Temperature gap by rack sensor placement

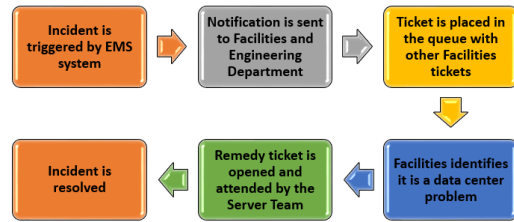
### Data center Layout Restructuration

Data center was mapped to identify the racks by application and service. During this process, all old servers no longer in production were shut down and decommissioned. Remaining servers were distributed throughout the data center to maximize heat dissipation. This improvement also gave the server team a more accurate count of active servers.

### Data center Layout Restructuration

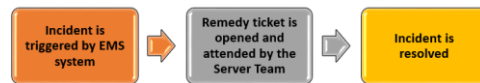
One of the major objectives of this project was to improve the incident response of server team technicians. Under the old process all incidents involving the environmental monitor system were routed to the Facilities and Engineering Department. Figure 4 shows the steps an incident generated by the environmental monitor system had

to go before it reached the server team at the IT Department.



**Figure 4**  
Old incident response process flow

Once the incident was recorded in a remedy ticket, the resolution and priority of the ticket was handled by the server team making it the IT Departments priority. To improve the process the incident reporting process was taken away from the Facilities Team and aligned under the server team as shown in Figure 5.



**Figure 5**  
New incident response process flow

## RESULTS

The adequate placement of sensors in a data center helped the server team document and justify a need for a more robust sensor configuration to optimize the performance of the data center moving forward. This improvement brought the data center front and center to top management. Management was presented with a risk of future service interruptions. Project presented that it is not possible to accurately monitor a data center of a room the size of 26 ft. x 80 ft with only three sensors. Similar data center rooms have an average of 250 sensors to monitor environment.

One of the major accomplishments of the project was to realign data center incident reporting under the Server Team in charge of the data center. This change helped improve the process reducing the resolution time from one week to less than 24

hrs. In addition, with the movement of this process under the server team also came the budget associated it maintaining the environmental monitor system. Under the previous process the budget was being diluted with other facilities needs of the agency never giving the data center the upgrades needed.

## CONCLUSION

The organizations as a whole had a well-established maintenance program and a robust enterprise remedy system, but it did not have the capability to monitor the environment in the data center to provide the response needed to avoid unscheduled service interruptions. The project was successful in reducing unscheduled service interruptions by evaluating the current incident response process, changing the server layout configuration and optimizing the sensor placement within the data.

Even with the current data center environmental monitoring system in place that is inadequate, system components were able to be relocated to significantly improve the monitoring capabilities of the current system. Top management is now aware of the risk and the Agency is adopting this project's recommendation to change the environmental monitoring system. New recommended system will go from having 3 sensors to 267 sensors.

Another key accomplishment of the project was to realign the incident response process to the correct department significantly reducing the technician's response and incident resolution time.

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