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Automation: Solution to the shortage of personnel in the Data Center

Introducción

In a not-so-distant past, as the era of computing advanced, there was talk of replacing human work with that of machines. It was believed that humanity would eventually face a labor crisis linked to the lack of demand triggered by the progress of machines.

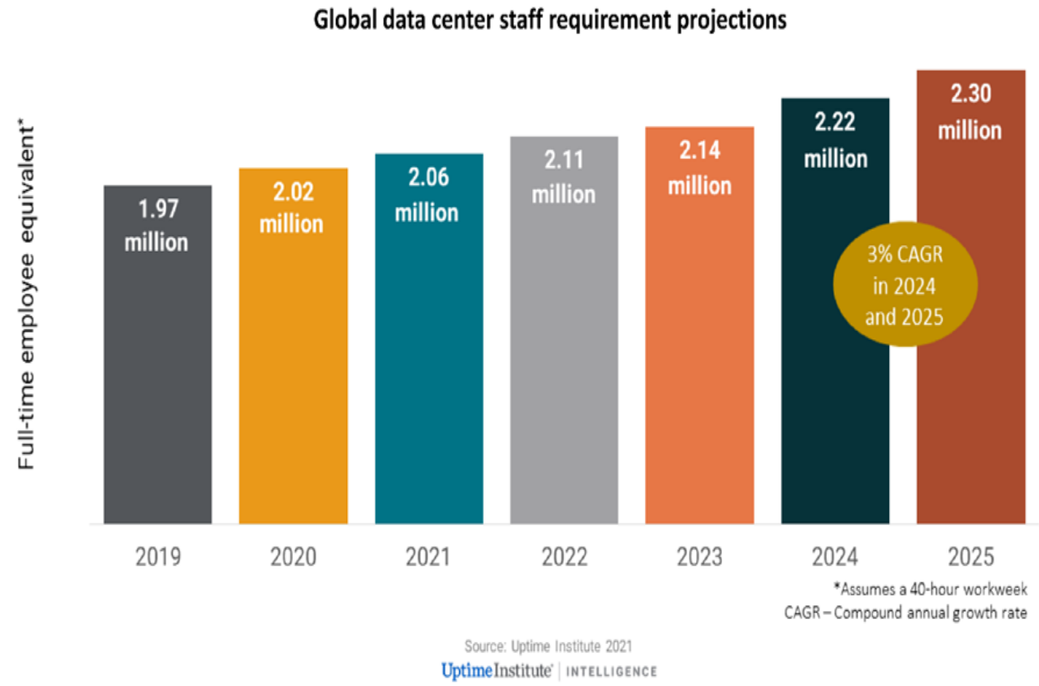
That crisis is approaching and is becoming increasingly evident. However, contrary to what was believed decades ago, it is all unfolding due to a lack of supply of skilled labor in the world of technology amid the growing demand.

These are some of the positions with the highest demand identified by recruitment and talent management specialists from leading Human Resources companies in Argentina:

- •Data Science and Business Intelligence
- • Digital Marketing Specialist
- • Web and Mobile Designer
- • Fullstack Developer
- • Network Specialist
- • Cybersecurity Specialist
- • On-premise/Cloud Infrastructure Manager

This situation was further propelled by the digitization of services driven by the Covid-19 pandemic, and as a result, the world of the data center was particularly affected. Professionals in areas such as infrastructure, networks, design, operation, maintenance, cybersecurity, etc., are in demand as the demand for data processing increase

Addressing the problem solely by generating more professionals through incentives for relevant university careers, improved in-company training, or higher remuneration is not enough. According to a survey by the Uptime Institute, it is projected that data center personnel requirements will grow worldwide from approximately 2.0 million employees in 2019 to nearly 2.3 million in 202.5



Evolution of Personnel Requirements in Data Centers Worldwide

Therefore, the actions mentioned above should be complemented with others related to a different approach: Automation. Achieving the liberation of personnel from repetitive and error-prone tasks to utilize manpower more efficiently.
The next section will describe what is understood by Automation in the data center world, the current state of the sector, and its application through various technologies, especially DCiM.

Solving the Personnel Shortage Problem through Automation

Recognizing When It's Necessary

With the passage of time, the incorporation of new technologies, and the market demands imposed by the pace of digital consumption, critical infrastructures are destined to rethink their business model, renew their assets, and, above all, incorporate new agile management and operation processes.

If currently, there is a failure to meet the demands of both internal and external customers, before addressing a personnel shortage problem, the focus should be on automation

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Automation in the data center involves the use of technology to perform operational, management, monitoring, and maintenance tasks with reduced human assistance. These tasks are slower, less efficient, and more error-prone, leading to significant waste of employees' working time.

Today, both traditional central physical infrastructure and Edge (network edge) infrastructure must be covered, along with the virtual infrastructure related to cloud computing. Such a data center is now referred to as 'software-defined.'

An automated software-defined data center (SDDC) is the combination of software-defined computing (containers or virtualization technologies), storage, and networking with an additional layer of software for management.

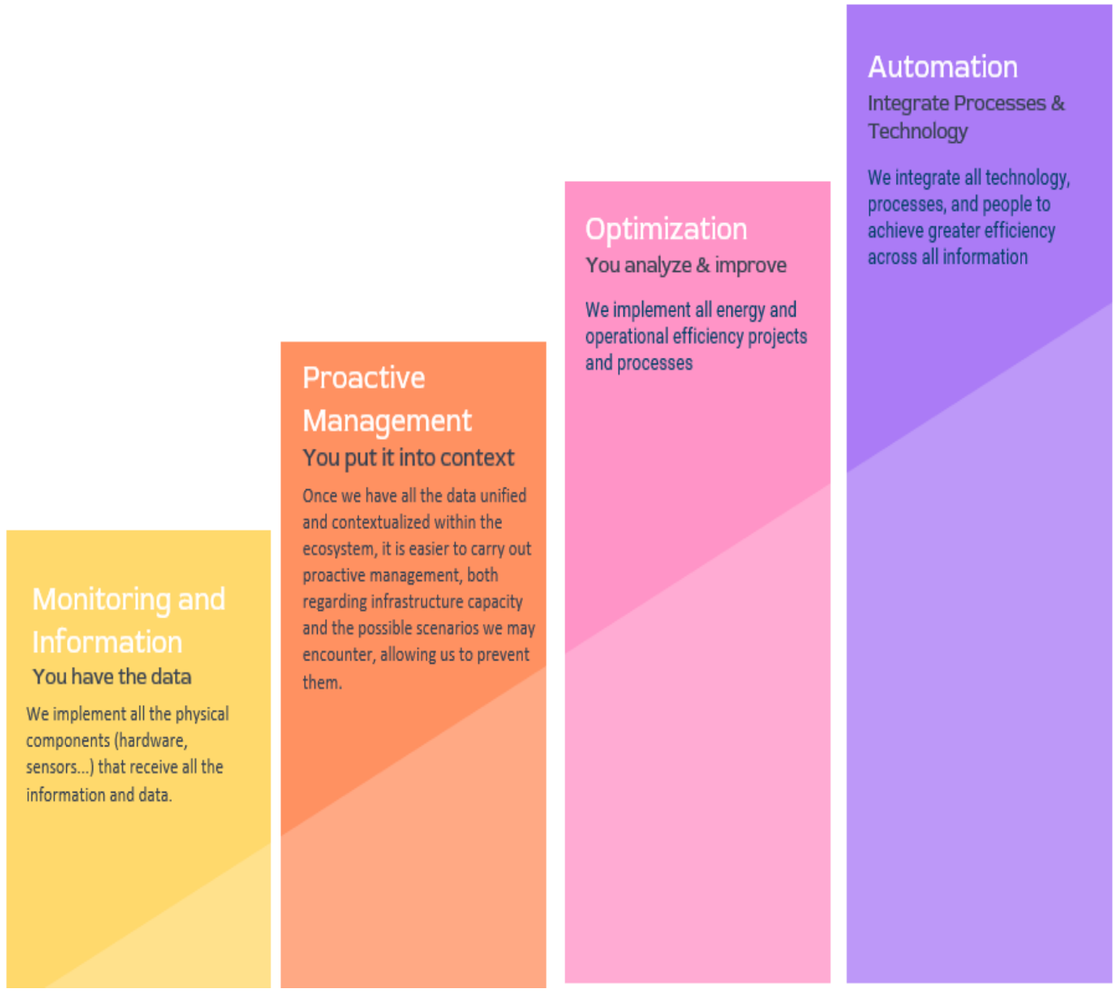
Management software that unifies virtual and physical infrastructure can greatly reduce the amount of active attention personnel must dedicate to daily operational management.

Here are the most obvious points to identify where automation is necessary in a current data center:

Management: Knowing where I am and where I should be

The technology associated with the management and operation of data centers has evolved over time, with an increasing number of tools covering various areas associated with them. The ecosystem encompasses both physical and digital infrastructure, especially with the continuous growth of cloud computing.

Based on market knowledge, surveys in data centers from various businesses over several years, and experience in implementing these tools, Bjumper has identified the following states and the path to automation.



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1. Monitoring and Information

As a first step, all data obtained from communication with the elements of the physical and logical infrastructure should be monitored to control their operation and identify potential sources of faults that could lead to problems or service outages

2. Proactive Management

These data must be transformed into information for proactive decision-making. This is achieved by unifying them in a tool and contextualizing them within the data center. Identifying interrelationships from the physical layer to the logical layer is crucial for conducting root cause analysis of failures and acting preventively to avoid repetition. Additionally, understanding which equipment will be affected upstream due to a change downstream is essential.

If we add the capability information within the data center, simulated scenarios of different situations can be conducted for decision-making in an anticipatory and more efficient manner.

3. Optimization

This is where we begin to address part of the labor shortage problem. It is achieved through operational efficiency gained by tackling daily tasks with these tools and using the surplus time to address the growing demands of the data center. Additionally, energy efficiency will be achieved through better planning and utilization of space, power, cooling, and network resources.

4. Automation

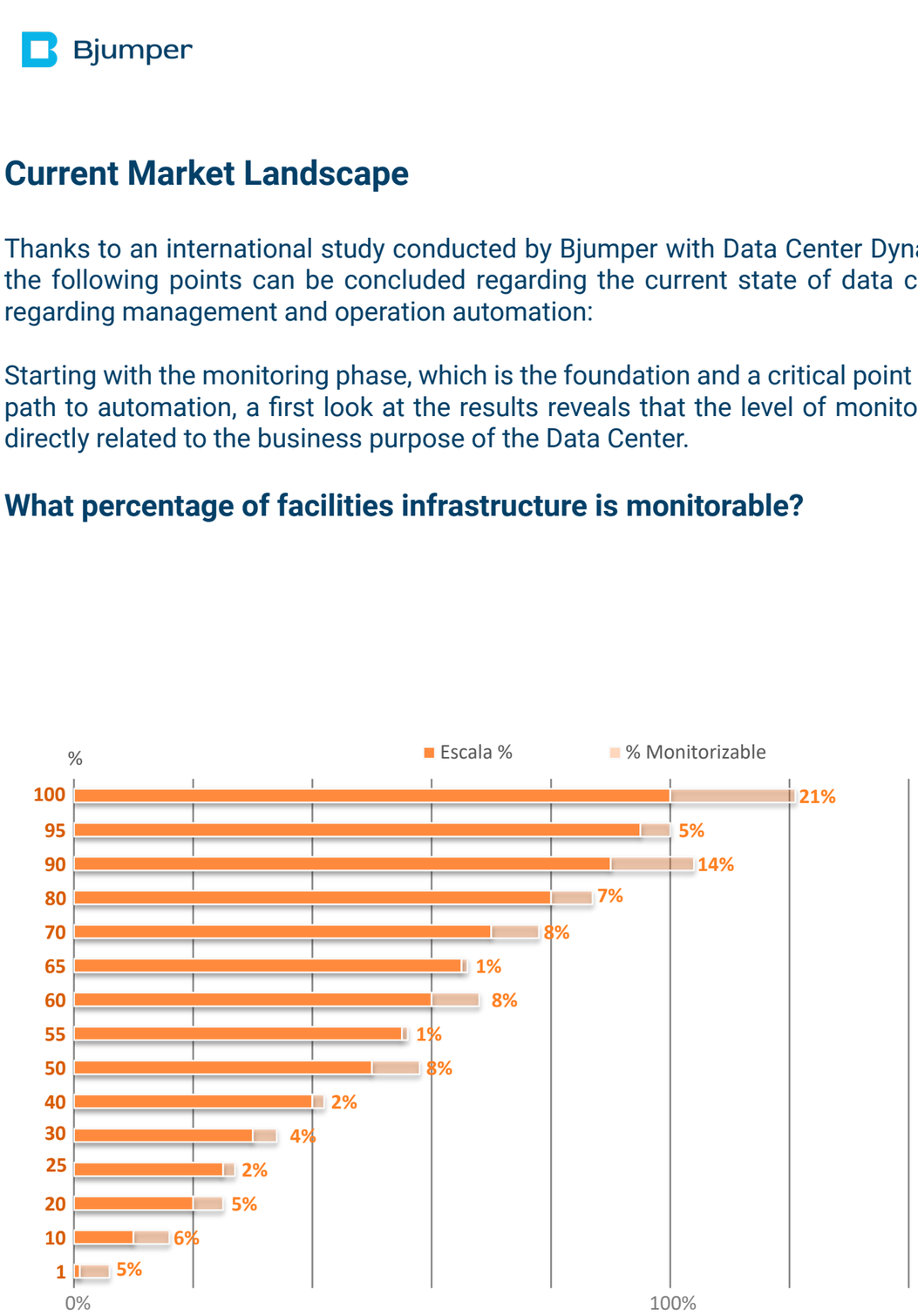
Finally, if everything seen before is unified under the same platform, adding process management that connects people with infrastructure and various tools, we can now talk about automation

Current Market Landscape

Thanks to an international study conducted by Bjumper with Data Center Dynamics, the following points can be concluded regarding the current state of data centers regarding management and operation automation:

Starting with the monitoring phase, which is the foundation and a critical point on the path to automation, a first look at the results reveals that the level of monitoring is directly related to the business purpose of the Data Center.

What percentage of facilities infrastructure is monitorable?

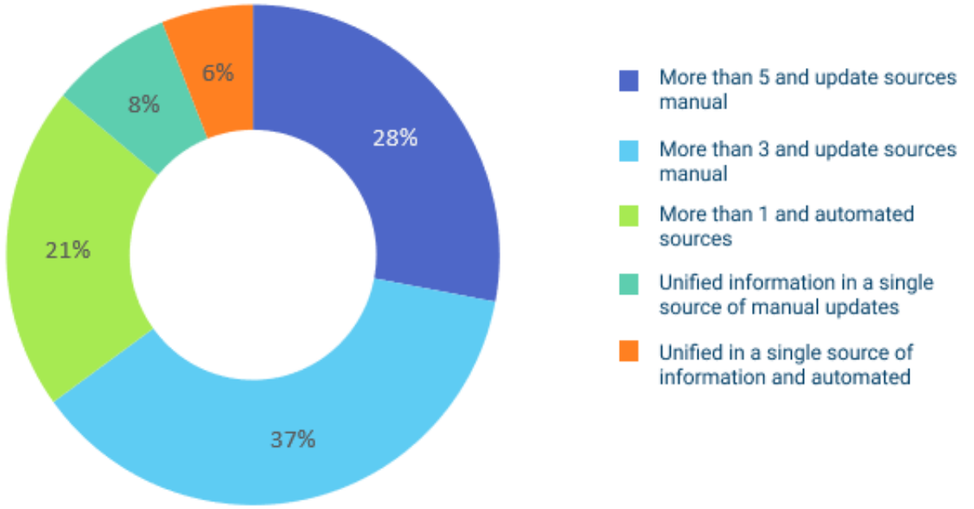


Saying that 64% of respondents have more than 60% of their infrastructure already monitored is very positive; however, that same 64% of respondents do not directly control what happens in the remaining 40% of their infrastructure.

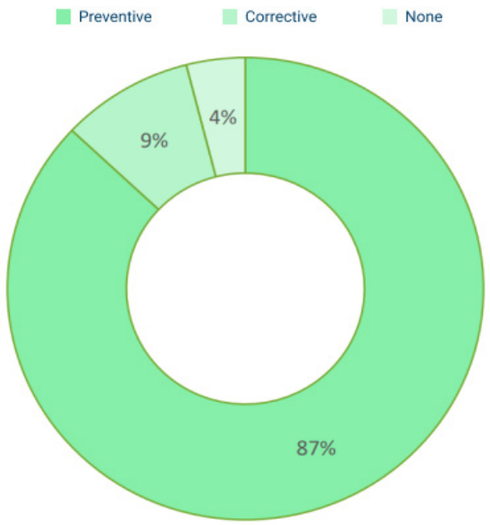
If we focus on the second phase, proactivity, we can measure it through various questions: those that indicate the number of information sources and how we treat them, as well as a critical point for data centers such as maintenance and where we focus, whether on corrective or preventive measures.

Data sources: What are the available sources in the data center?

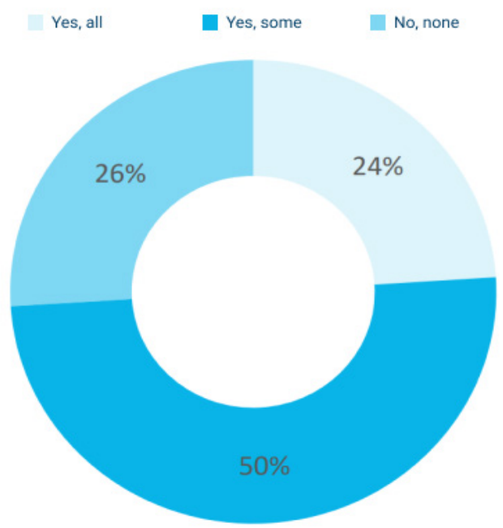
*Types of information sources: Excel, CAD, Visio, CMDB, SCADA, BMS, etc



Maintenance processes in the DC: What are the processes you typically work on, such as Preventive or Corrective?



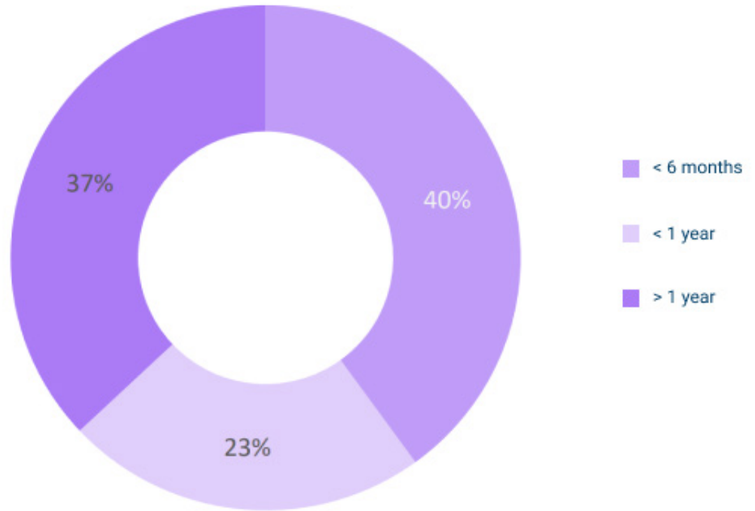
Are these processes done in an automated manner? *Automated means with integrated information sources and documentation with ticketing processes



Performing a cross-analysis on the results, there is indeed a clear relationship between those who indicate not having automated processes and the number of manual data sources. This is logical since, without the unification of information and that automation in updating data, it becomes impossible to automate preventive maintenance where you can generate a report of potential impacts.

If we move to the third level, optimization, understanding that we start from the point where unified information within its context is already available and the goal is to begin making plans to be more efficient, the following results were obtained:

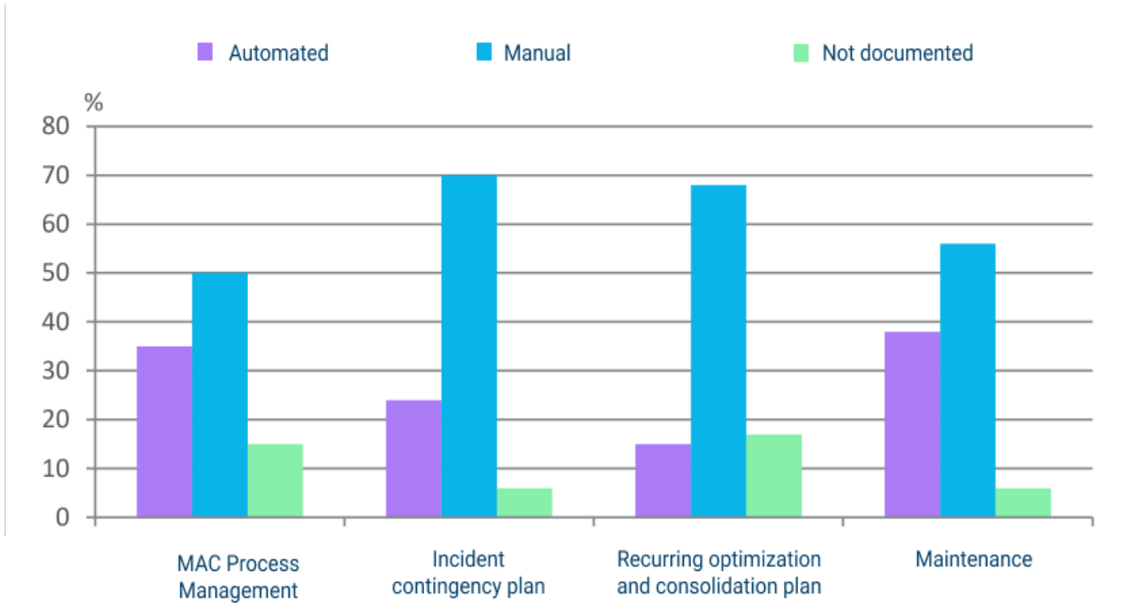
When was the last time you conducted an optimization study or exercise that included the removal of unused cabling, server consolidation, climate set point adjustment, or balancing consumption per phase in the data center, among others?



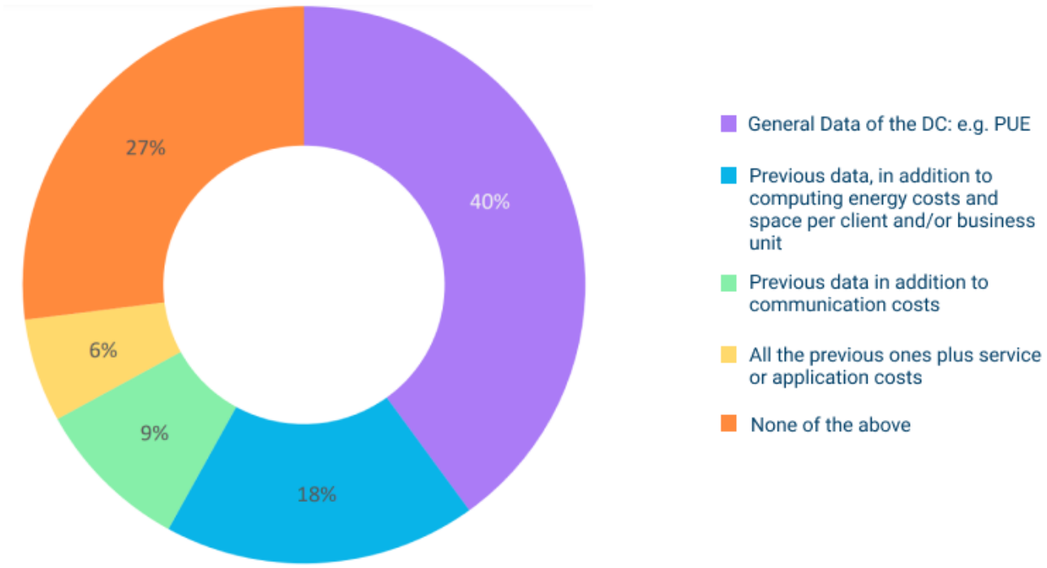
Finally, regarding automation, four processes were taken as an example to see what information is obtained automatically. These were the results:

Process Definition: How are the following processes defined and documented?

** MAC (Move, Add, Change) | **Automated means with integrated information source and documentation through ticketing processes and task assignment to resources | ***Documented manually but executed using non-automated tools, via email, meetings, and file sharing.

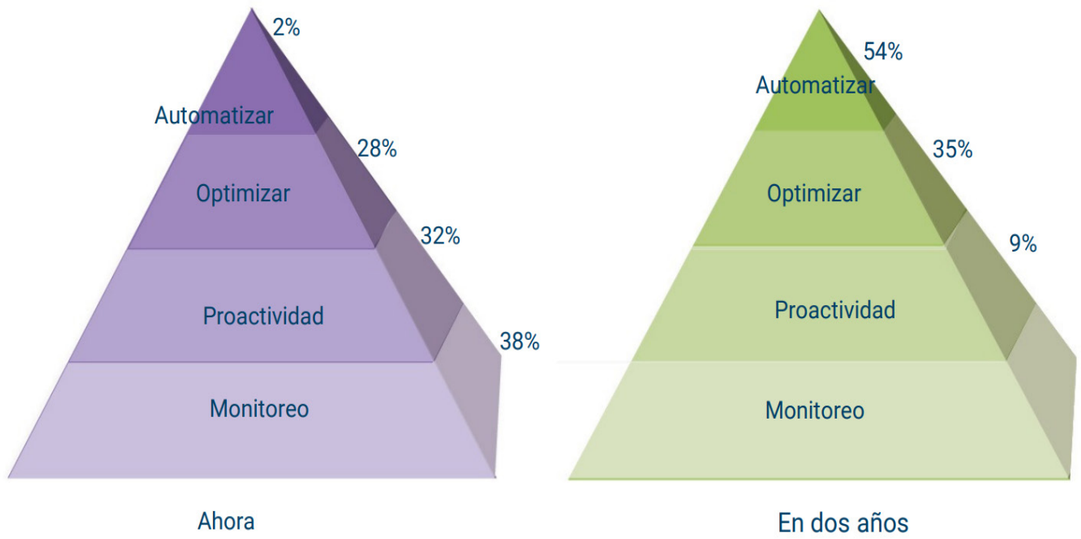


Currently, what information are you able to obtain automatically?



In conclusion, there is a clear consensus that the path to follow in the management and operation of the data center is automation, but currently very few are achieving it.

Where am I now on the pyramid? Where do I think I will be or want to be in two years?



Launch the Automation plan

Once the need for automation is detected and the stage of data center management is identified, the issue must be addressed in two areas:

- Transform the infrastructure into a hybrid one.
- Implement an Integrated Management System (DCiM)

Transforming the infrastructure into a hybrid

An ecosystem where physical and virtual infrastructures coexist is referred to as hybrid. In the long term, replacing physical equipment with the use of storage, computing, and network components controlled by software (an SDDC) results in optimizing the use of human resources in the data center when considering the following scenarios:

Simplified hardware management

The SDDC replaces isolated hardware technologies and enables centralized management of all integrated components. This makes it easier for providers to create and implement resources, and for customers to control and supervise them. Companies also benefit from not having to purchase hardware.

High reliability

SDDC solutions are highly secure, as software-based architecture easily compensates for hardware failures. In doing so, the corresponding workloads are swiftly transferred to other components in a very short time, without requiring manual access to the faulty devices.

Less technical knowledge required

Standardization, open protocols, and manufacturer-independent programming mean not only more flexibility but also less reliance on specialized knowledge. Therefore, using a software-defined data center eliminates the need for a large number of additional training courses as well as specialized staff

Dynamic connections

A software-defined data center is perfect for establishing dynamic connections with individual bandwidth allocation and guaranteed Quality of Service (QoS) between different locations. This efficiently connects different company locations (internal or partners) or utilized data centers.

IT process automation

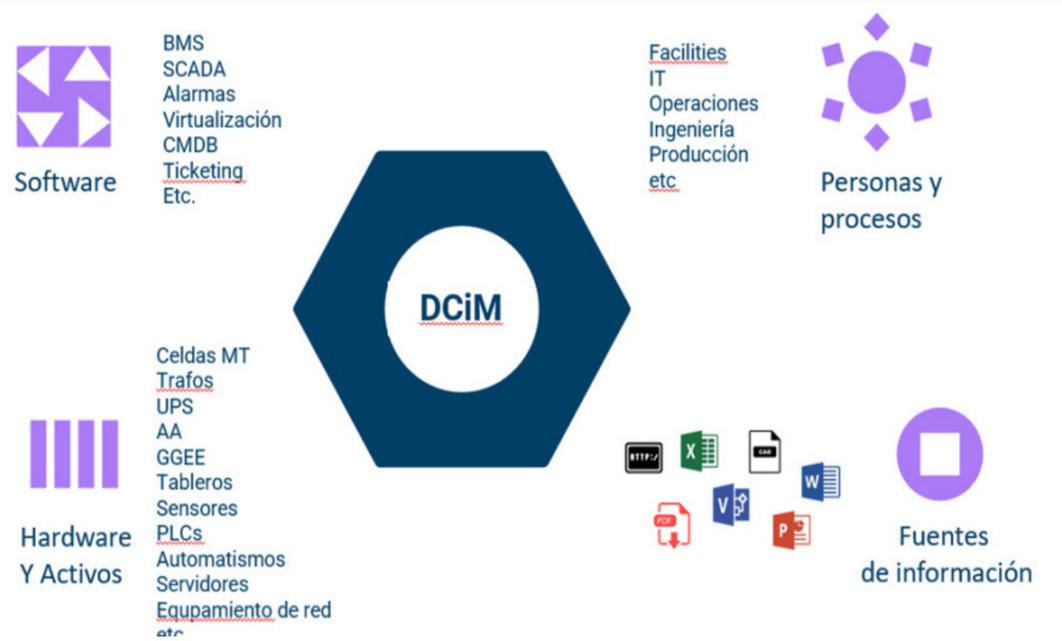
Virtual data centers greatly simplify the work of administrators, especially through the automation of processes that are normally performed manually. The software-defined approach is, therefore, a significant aid in easing the burden on existing IT staff.

Implementing a comprehensive infrastructure management system (DCiM)

Whether it's an on-premise or hybrid ecosystem, a Data Center Management System (DCiM) allows unification of the infrastructure and information from different systems (ISTM, BMS, Ticketing, etc.) to integrate them with people and processes.

This way, operational automation is achieved, bringing enormous operational efficiency through significant savings in task execution times and reduced human errors.

DCiM: The foundation of operational efficiency

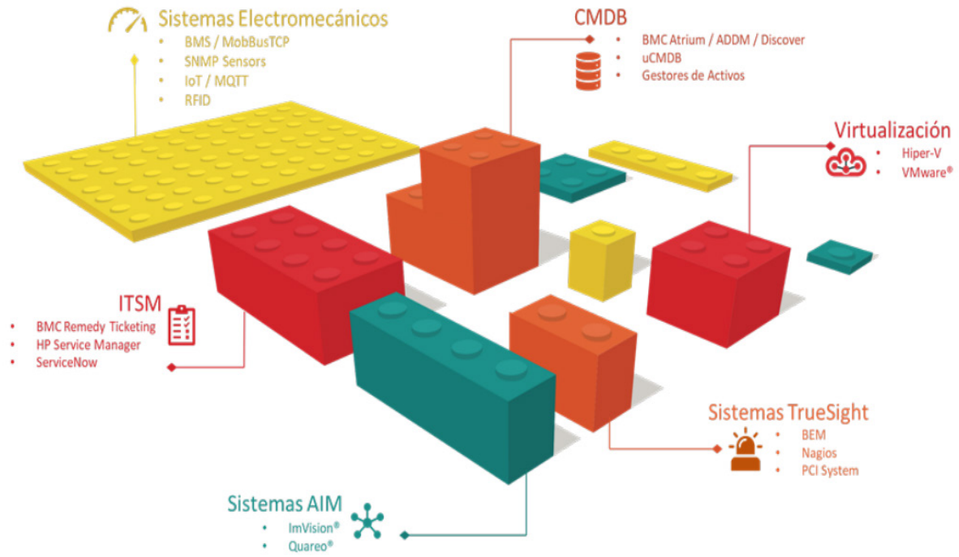


Unification of information in DCiM

Looking at illustration 2, we can understand the broad spectrum of equipment, software, people, processes, and different sources of information that are part of a data center.

DCiM enables interaction among all these components to turn it into useful information for decision-making. By integrating with other systems, through this tool, the following functionalities will be available:

Monitoring and management of alarms and reports	Electrical, cooling, network, computing, and storage infrastructure
Asset management	Layout and mapping, features, electrical and network traceability, physical and logical layer interdependencies.
Capacity management	Physical space, climate, network, electrical power, computing, and storage
Change Management	Processes, tasks, maintenance

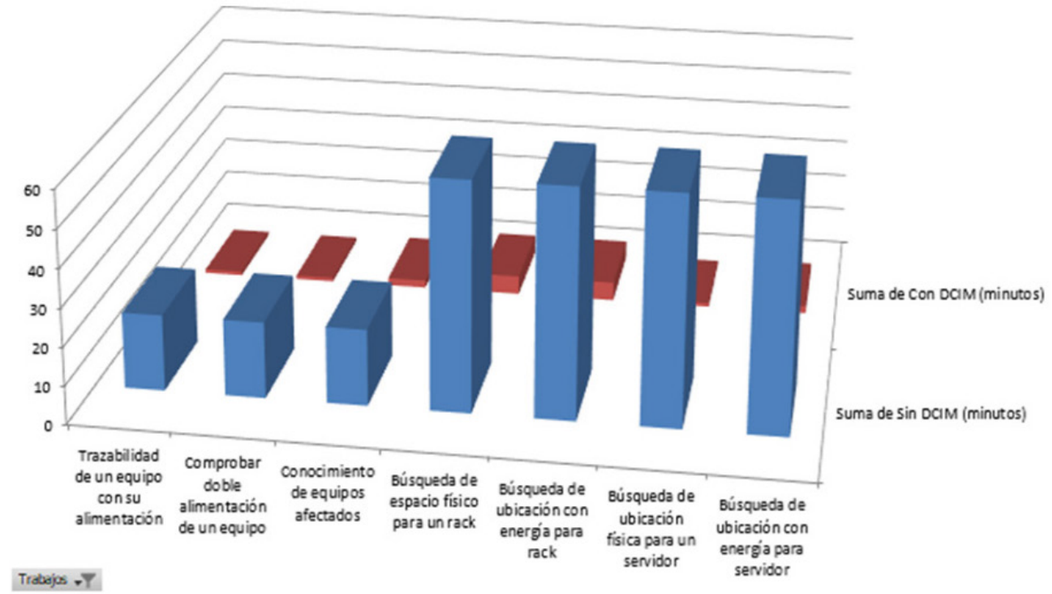


Ecosystem of integrable technologies with DCiM

These functionalities allow us to achieve the two main aspects to address the problem of labor shortage through operational efficiency:

Reduction of task execution times

From basic tasks such as placing equipment in a rack to calculations of indicators like PUE, the time difference in performing them is quite significant. Let's consider a simple analysis as an example:



Task execution times with and without DCiM

These time savings can be used for a better distribution of tasks among the current staff and address other needs more focused on delivering the service.

Process automation

Standard processes and workflows must be coordinated across multiple groups and automated. Relying on individuals and multiple groups to manually update, for example, IT service tickets, is problematic and creates unnecessary delays. With automated workflow tracking, teams know precisely when a task is completed, and the next step can begin immediately, thus saving time, increasing efficiency, and eliminating delays.

An extra: Artificial Intelligence

The application of Artificial Intelligence (AI) projects in Data Centers is generating multiple efficiencies in different fields. Applications ranging from virtual reality in maintenance to machine learning for predictive analysis of anomalous behaviors are some examples that can already be found in today's market.

The efficiency points that artificial intelligence brings to mitigate personnel shortage problems are those that allow significant operational efficiency for better task distribution among workers. Below are the most important examples:

Failure prediction

Unplanned downtime and its subsequent resolution generate a significant amount of lost time in tasks that are not related to addressing the increasing demand in Data Centers.

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In this sense, there is now self-management based on Deep Learning to predict failures ahead of time. Additionally, by using Machine Learning-based recommendation systems, solutions to any incident are quickly identified and addressed, or even before they spread and cause service degradation.

Intelligent data monitoring and storage

By incorporating Machine Learning, Artificial Intelligence can take on the routine work of monitoring vast amounts of data and make the professionals dedicated to these tasks more efficient.

Furthermore, to address the storage of this data, Artificial Intelligence has the potential to make decisions about optimization by learning I/O patterns and data lifecycles, helping to improve storage solutions and freeing up time for dedicated workforce to this.

Virtual and Augmented Reality

Virtual reality involves constructing a complete 3D environment that matches the real space. The outside world is replaced by a virtual one where the technician can perfect tasks and become familiar with sophisticated equipment before entering the facilities.

On the contrary, augmented reality adds to a person's vision instead of replacing it. A technician can see overlays in the environment using a smartphone or by using transparent smart glasses like Microsoft HoloLens for more sophisticated interactions in a mixed reality environment.

In this case, technologies can help in two aspects to combat the job shortage:

- Capturing, training, and guiding the existing or incoming workforce more efficiently to turn them into highly specialized individuals.

This way, it reduces the risks of human errors and associated lost time. Additionally, when recruiting personnel, it generates interest and awareness about data center careers among young people.

- Performing tasks remotely through augmented reality-guided mentoring

With remote mentoring in augmented reality applications, a technician wearing the glasses acts as the hands in the field, while a remote expert acts as a guide, providing instructions for each task.

Conclusions

Various ways of addressing the issue of the current and future shortage of personnel in the data center industry have been discussed in this text. The best way to tackle it is by understanding that not all the problem lies outside, but there is a lot to work on internally for better operational optimization of the existing staff.

Within the core solution, automation, there are solutions that have been developed for years and that's where we should start the journey. Having a virtual data center with software-defined computing, storage, and networking, coupled with a tool that achieves unified management of this infrastructure with the traditional on-premise systems and personnel from the different areas that compose it (DCiM); these are the first steps to address.

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While artificial intelligence will play an equally important role in a short time, applications are still in developmental stages and their adoption will take a few more years. Any application of AI in the data center will require greater trust in the technology. More training on historical machine and process data is still needed for AI to assist in operational decision-making.