Telefonica drives energy efficiency in its data centers with an AI-based digital twin

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Telefonica has taken a decisive step in its energy-efficiency strategy with the implementation of an innovative management and optimization solution developed by Telefónica Germany in collaboration with the company EkkoSense. The project, within the Autonomous Network project (ANJ) and already underway, uses IoT sensors, advanced analytics, and a real-time 3D digital twin to transform the thermal management of critical infrastructure and advance toward a more efficient and automated operating model.

Data centers and technical sites represent one of the largest energy-consumption hotspots in the technology and telecom sectors. As data traffic grows and capacity demands surge, optimizing energy consumption is essential to contain costs, reduce environmental impact, and strengthen the operational resilience of the network.

With this project, Telefonica Germany directly addresses this challenge by introducing real-time intelligence and predictive capabilities to manage climate control more precisely, improve Power Usage Effectiveness (PUE), prevent premature expansions, and optimize infrastructure investments.

The deployed solution allows us to monitor the status of critical equipment in real time, maintain a dynamic thermal and load risk map and receive automated recommendations to eliminate inefficiencies, extend equipment life, and maintain operational continuity. It also allows the digital twin modeling, visualizing, and projecting the physical, electrical, and thermal capacity of rooms, maximizing efficiency without compromising performance, and analyzing as well infrastructure through simulation against failure scenarios and design action plans to minimize risks.

Deployment is remarkably fast: new sites can be integrated within

days, without service interruption and without the need for construction work or additional infrastructure.

As Rüdiger Kunze, Telefonica Germany – Head of Housing & Site Infrastructure, highlights:

> Digitalization makes the data centre visible, automation makes it intelligent. EkkoSense's Digital Twin combines both, enabling operators to redefine energy efficiency and proactively guide their infrastructure into the future.
>
> One of the main barriers to data centre optimization has always been the complexity of traditional tools such as DCIM. EkkoSense solves this challenge for Telefónica Germany by drawing on new levels of sensing granularity, real-time analytics, and 3D visualization capabilities to create a concise digital twin of the data centre environment. This approach makes immersive real-time optimization a reality – from the smallest Edge site through to the largest facility

, added EkkoSense CEO Dean Boyle.

Results That Drive Efficiency

Initial evaluations of the program indicate an estimated 15–20% reduction in energy consumption for cooling systems. These savings have an immediate impact on energy OpEx and help improve operational efficiency.

In parallel, continuous monitoring of thermal behavior enables avoiding unnecessary investments thanks to better utilization of existing capacity, and to prevent risks through predictive alerts and proactive maintenance. It also helps simplifying reporting with automated and auditable data, building a more resilient operating model capable of handling increases in IT load.

Scalability for an Efficient Network at Telefonica's Group

The project will be progressively rolled out over the next years, prioritizing the highest-consumption sites. Telefonica will continue extending this approach to other markets within the Group, sharing learnings, developments, and success stories to accelerate the adoption of energy-efficiency technologies.

Through initiatives like this, Telefonica reaffirms its commitment to building more efficient, resilient, and sustainable digital infrastructure—capable of supporting growing traffic, expanding digital services, and advancing the transition toward a more responsible energy model.

A demo of this solution is available both at LaCabina, the space in Distrito Telefónica dedicated to technological inspiration, and at the Innovation Experience Area of O2 Telefónica Germany in Munich, who made thisdemonstration possible together with EkkoSense. LaCabina showcases additional demos led by the GCTIO area showing how Telefónica is making steady progress on its Autonomous Network Journey.

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