Green thinking data center technology

Innovative, breath-taking, world changing, sustainable:
The Qub3 – Green thinking blockchain technology

Concept paper of Sustenergy Tec GmbH

Mobile mainframe computers and Innovative data center architecture

A team of engineers, IT experts and economists dealt with the idea and at the same time today's problems with energy-efficient blockchain technologies that should improve the world, the way of working, trading, the financial market, but what is currently not efficient and is not possible without horrendous energy consumption, water cooling and large-scale plant installations.

The Qub3 is the 100% flexible and customizable, CO_2 consumption and cost-reducing system
that will change the future of almost all industries. An innovation that takes all known and future industries and infrastructures to the next level and makes them more transparent.
Some examples of applications include the electric car industry, AI, autonomous driving, the financial industry, mass data management and all existing and future digital infrastructures.

The Qub3:
The engineered mainframe computing system has been completely redesigned in terms of the basic architecture of known computers and their arrangement.
It represents an **air-cooled server system** with maximum and stable performance values and in the same time **only 3% cooling energy consumption (PUE_{Real} 1.03)** compared to all previously used and known systems.

The new constructed plant structure represents an interlocking and very complex system of many factors and segments in regard to the system itself and its development.
This system is designed for stationary mainframe systems and developed on the premise that the user could additionally provide upgradeable flexibility to a certain extent and without any further efforts.

We created a completely flexible and new server, with low working temperature of all hardware elements in combination with efficient energy expenditure on lowest level.
In this structure, a cooling energy consumption **of only** approx. 3 to 5 % of the energy requirement of the computing power is guaranteed (at an ambient temperature of approx. 23° C in the laboratory test).

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As a result and due to the map and computer architecture described above, as well as by including the control-related and system-related, design-related operating temperature controls, an unprecedented energy cost efficiency is achieved.

This not only significantly decreasing the maintenance intensity, but also results in optimal use of resources.
The tremendously reduced temperature influence in the Qub3-system significantly increases the life cycle of the hardware, which leads to a decrease of CAPEX invests.

Simulation of the usage of Qub3 in sea container (size 20ft or 40ft)
Originally, the production of large three-dimensionally spatially limited mainframe systems with maximum room/performance efficiency was conceived as a supplement due to the request of interested parties.

The requirement was being able to produce both indoor and outdoor systems in a factory-ready element design. In addition, the same parameters were implemented as a scale as they were designed for the stationary systems. In the case of indoor plants, an additional heat recovery system could be created and used as a by-product to conserve resources.
In the case of outdoor facilities, this possibility would also exist, but so far has not been constructively involved for pragmatic reasons.

For both options:
Despite the limited space of a 20ft sea container, the Qub3 system can be equipped with approx. 1600 to a maximum of 2100 cards, which can be used at a core temperature of 60° to max. 70°C (with a temperature difference of approx. 3° to 4°C between the individual cards).
The same basic structure could also be used to create complete systems of high-performance computers (ASIC). In this case, around 720 Qub3 modules could be used as a complete system in the space of a 20-foot sea container.

Due to the limited spatial conditions and the high number of built-in G-cards or computers, a particularly simple and fast possibility of hardware exchange has been developed, which leads to the fact that an exchange of GPU (OPEX costs) can be done with "on-board tool" by 2 experts within a very short time.

The designed system allows the installation of GPU of different brands and gives you the freedom to customize your new computing system.

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It is foreseen that the entire unit will be manufactured in Hamburg or in the vicinity of Hamburg and that it will reach its destination by truck or ship from this production location.
This is where the final assembly and commissioning of the systems is carried out by the designers.

The difference to other systems can be found in the technical possibility to offer an identical power volume in the outdoor version.

For the transport of the indoor facilities approx. one and a half, in the outdoor version two sea containers of the same size are required.

The possibility of setting up a 40ft sea container, which is also requested, is systemically similar and would then be capable of being fitted with approx. 3200 to 4200 GPU. However, this variant has not yet been finalized in terms of engineering.
Since the mainframe systems are each very complex systems, which have to be designed and adapted to their location for complete performance efficiency, the Qub3 designers will have a site-visit before starting the system production.

Innovative data center architecture

Functional and system explanation of the system - Qub3

One of the basic requirements for the development and design of the new computer architecture was the usability of unchanged, commercially available, standard hardware components or those already in use. In addition, all computer units had to ensure that the core temperature of the working units remained as constant as possible. Particular attention was paid to the reusability of existing data system components in order to achieve a largely economic balance for the restructuring.

Since the plan was to design these computers / data centers for worldwide use, only the outside air surrounding the data center with its global temperature differences had to be sufficient as a coolant.
The measured / determined PUE_{Real} values of this **patented system** of < 3% - corresponding to PUE ≤ 1.03 - were achieved in a moderate climate - approx. 23° to 27°C - and **certified by TÜV-Nord Systems GmbH & Co. KG**, test center for refrigeration, air conditioning and ventilation technology in Essen (Germany).

The design offered by Sustenergy Tec GmbH and developed by the designers is based on the implementation of physical conditions, modified server architecture, basic aerodynamic and aerodynamic physics which, coupled with the chief designer's knowledge of building physics and aerodynamics, was implemented almost consistently.

This made it possible to achieve almost identical core temperatures for the individual computer elements (here: graphics cards), which had a spread of only 3° to 4°C, with a maximum of 5° as an outlier.

Further planning specifications were the fundamental elimination of e.g. air additions with nitrogen, water or similar environmentally harmful cooling systems as well as the requirement for additional cooling systems and the smallest possible space requirement for the stackable modules.

By achieving the requirements, it is also possible to use a particularly efficient exhaust air utilization through heat exchangers with the help of the slow, concentrated warm air flow, with the expectation (can only be determined in situ) of achieving a "PUE" value of < 1.0 when heat recovery is included.

The overall system is based on a fundamental architectural change to the arrangement of the computing elements in a stackable modular design, in which both the physical heat flows and the aerodynamic flow specifications lead to an even distribution of cooling air. It is not necessary to modify the cooling elements. The manufacturer's warranty exclusions could even be waived, as the cooling situation is identical for all computer elements. The individual modules are shielded from each other to protect them from external temperature influences.

This patented system revolutionizes the energy requirements of data centers and makes data centers sustainable and green.

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