

Mechanical Engineering Master's Defense

Understanding Cooling Delay in High Density Data Centers

School for Engineering of Matter, Transport and Energy

Dineshbalaji Ramaraj

Advisor: Dr. Sandeep Gupta

abstract

With the ever increasing demand for high-end services, technological companies have been forced to operate on high performance servers. In addition to the customer services, the company's internal need to store and manage huge amounts of data has also increased their need to invest in High Density Data Centers. As a result, the performance to size of the data center has increased tremendously. Most of the consumed power by the servers are emitted as heat. In a High Density Data Center, the power per floor space area is higher compared to the regular data center. Hence the thermal management of this type of data center is relatively complicated.

Because of the very high power emission in a smaller containment, improper maintenance can result in failure of the data center operation in a shorter period. Hence the response time of the cooler to the temperature rise of the servers is very critical. Any delay in response will constantly lead to increased temperature and hence the server's failure.

In this paper, the significance of this delay time is understood by performing CFD simulation on different variants of High Density Modules using ANSYS Fluent. It was found out that the delay was becoming longer as the size of the data center increases. But the overload temperature, ie. the temperature rise beyond the set-point became lower with the increase in data center size. The results were common for both the single-row and the double-row model. The causes of the increased delay are accounted and explained in detail manner in this paper.



January 12, 2015; 1:30 PM; ERC 593