A realistic distributed storage system that minimizes data storage and repair bandwidth. *

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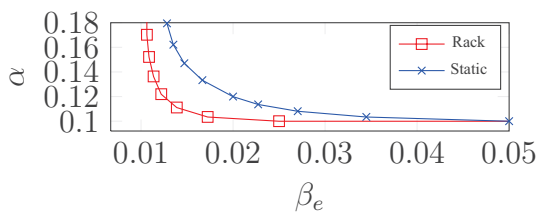
In a realistic distributed storage environment, like the ones used in companies dedicated to the task of storing information over a network, storage nodes are usually placed in racks, a metallic support designed to accommodate electronic equipment. It is known that the communication (bandwidth) cost between nodes which are in the same rack is much lower than between nodes which are in different racks. In this paper, extended in [1], a new mathematical model for a distributed storage environment where the storage nodes are placed in two racks is presented and analyzed.



We provide a complete analysis of the model for the amount of stored data per node α and the repair bandwidths $\gamma^1 = d_1\beta_c + d_2\beta_e$ for the nodes in the first rack with d_1 helper nodes and $\gamma^2 = d_2\beta_c + d_1\beta_e$ for the nodes in the second rack with d_2 helper nodes. Note that β_c and β_e are the amount of data sent for each helper node in the same and in the other rack, respectively. We include the generalization of the threshold function which minimizes α and β_e. This new threshold function fits in any previous model ([2] and [3]) and allows to represent the information flow graphs considering different repair costs. By comparing the tradeoff curves of the threshold function and analyzing the cost, we conclude that the rack model outperforms previous models in terms of repair cost, as it is shown in the figure in comparision with the static cost model [3].

References

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