

Comparative evaluation of Virtual Environments: Virtual Machines and Containers

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Cloud computing is a major component of the IT industry. Current cloud computing solutions make extensive use of virtual machines because they offer a high degree of isolation as well as an opportunity to optimize for effective utilization of available infrastructure. However, virtual machines also rely on a degree of abstraction which may result in performance degradation thereby affecting the users or customers. New advancement in container-based virtualization techniques simplifies deployment and offers similar opportunities in the control and optimization of resources.

The availability of these two alternative technologies has resulted in a number of contrasting opinions and studies. However, the advantages and disadvantages of each technology when compared against its alternative are not clear, which leads to difficulties for infrastructure providers who aim to optimize the use of their resources and the service provided to their customers.

In this study, we explore the performance profile of traditional virtual machine deployments and contrast it with containers. We use a set of workloads that stresses CPU, File I/O and MySQL server to evaluate the performance while scaling up the deployments incrementally. We also evaluate the migration performance of the two on the same network. We use KVM as hypervisor for virtual machines and Docker as container manager. Our results point out that containers perform better in terms of both density and boot latency; however, the results are reversed in terms of migration performance due to the maturity of migration mechanisms for virtual machines which result in comparatively low service downtime. We also discuss the potential performance inhibiting factors as well as future optimizations.