VMShadow: Optimizing The Performance of Virtual Desktops in Distributed Clouds

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Abstract

We present VMShadow, a system that automatically optimizes the location and performance of applications based on their dynamic workloads. We prototype VMShadow and demonstrate its efficacy using VM-based desktops in the cloud as an example application. Our experiments on a private cloud as well as the EC2 cloud, using a nested hypervisor, show that VMShadow is able to discriminate between location-sensitive and location-insensitive desktop VMs and judiciously moves only those that will benefit the most from the migration. For example, VMShadow performs transcontinental VM migrations in ~ 4 mins and can improve VNC’s video refresh rate by up to 90%.

1 Introduction

Cloud computing has quickly become the paradigm for hosting applications ranging from multi-tier web applications to individuals desktops. Today, users manually determine which cloud location to run these applications based on broad estimates of their computation, bandwidth and latency needs. In this work, we argue that the cloud platform, rather than the user, is best suited for automatically determining the best location for hosting each application in a distributed cloud and transparently and seamlessly adjusting the mappings over time as application needs change. Towards this end, we present VMShadow, a system to transparently and dynamically manage the location and performance of virtualized applications in distributed clouds. Using virtual desktop infrastructure as an example, we show how VMShadow can optimize the performance of such desktop clouds. Desktop clouds run virtualized desktop machines that are accessed from thin clients using remote desktop protocols. Desktop clouds offer an interesting use-case for VMShadow, since desktops run a diverse set of applications, not all of which are location-sensitive. We prototype VMShadow in a nested hypervisor [2] and evaluate its efficacy using desktop VMs running on a Xen-based private cloud and Amazon’s EC2.

2 VMShadow Overview

Figure 1: VMShadow Architecture.

Figure 2: After migration, online streaming achieves lower VNC frame update times, directly improving user experience.

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1Note that the VNC player only sends a refresh request after receiving
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A response to its previous request. Thus, the lower the response time and round-trip times, the higher the refresh rate.

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